

FEDERATED MALAY STATES.  
MEDICAL REPORT FOR THE YEAR 1922.



VITAL STATISTICS.

1. The population of the Federated Malay States, as estimated, was at the end of June, 1922, 1,360,876.

The race distribution was as follows :

Europeans and Americans	...	...	...	...	...	5,986
Eurasians	...	...	...	...	...	3,274
Malays and other races of the Archipelago	...	...	...	...	...	522,069
Chinese	...	...	...	...	...	502,210
Indians	...	...	...	...	...	321,813
Others	...	...	...	...	...	5,524
						1,360,876

BIRTHS.

2. Thirty-four thousand nine hundred and six births were registered during the year, giving a birth-rate of 25.65 per mille population :

Year.						Births.	Birth-rate per mille.
1911	...	...	...	...	...	20,310	19.41
1912	...	...	...	...	...	25,426	23.50
1913	...	...	...	...	...	26,349	23.05
1914	...	...	...	...	...	27,978	24.61
1915	...	...	...	...	...	29,699	25.33
1916	...	...	...	...	...	29,337	24.20
1917	...	...	...	...	...	34,763	27.94
1918	...	...	...	...	...	33,011	25.70
1919	...	...	...	...	...	32,325	24.57
1920	...	...	...	...	...	36,556	27.05
1921	...	...	...	...	...	36,294	27.81
1922	...	...	...	...	...	34,906	25.65

DEATHS.

3. Thirty-five thousand and twenty-eight deaths were registered, giving a death-rate of 25.74 per mille :

Year.						Deaths.	Death-rate.
1911	...	...	...	...	...	40,914	39.11
1912	...	...	...	...	...	40,901	37.08
1913	...	...	...	...	...	38,000	34.00
1914	...	...	...	...	...	39,003	34.31
1915	...	...	...	...	...	33,899	28.92
1916	...	...	...	...	...	36,981	30.06
1917	...	...	...	...	...	42,514	34.17
1918	...	...	...	...	...	67,639	52.85
1919	...	...	...	...	...	38,645	29.37
1920	...	...	...	...	...	43,705	32.34
1921	...	...	...	...	...	38,077	29.18
1922	...	...	...	...	...	35,028	25.74

The death-rate is the lowest recorded for twelve years.

## CHIEF TOWNS.

4. The subjoined table sets out the estimated population and death-rate per mille of the principal townships during the past seven years :

Year.	Kuala Lumpur.		Ipoh.		Seremban.		Taiping.	
	Population.	Death-rate.	Population.	Death-rate.	Population.	Death-rate.	Population.	Death-rate.
1916 ... ..	61,443	27.73	29,915	30.15	11,397	52.55	22,237	36.00
1917 ... ..	63,064	28.45	31,032	32.67	13,620	55.35	22,859	31.00
1918 ... ..	64,686	38.34	32,150	35.92	14,082	81.66	23,481	41.61
1919 ... ..	66,308	26.36	33,238	23.56	14,544	45.38	24,721	37.45
1920 ... ..	67,930	30.00	34,357	22.64	15,006	34.05	25,434	39.90
1921 ... ..	81,197	27.02	37,194	20.38	17,479	36.16	21,178	50.05
1922 ... ..	84,476	21.36	38,895	21.78	18,398	27.93	21,296	35.08

## INFANTILE MORTALITY.

5. There were 5,963 deaths of children under one year of age, giving an infantile mortality rate of 170.83 per 1,000 births as compared with a rate of 183 for 1921.

## INFANTILE MORTALITY TABLE.

States.	Deaths of children under one year of age.		Death-rate per 1,000 births.	
	1921.	1922.	1921.	1922.
Perak ... ..	2,652	2,474	160.51	151.98
Selangor ... ..	2,095	1,852	202.14	189.08
Negri Sembilan ... ..	1,010	841	200.32	185.00
Pahang ... ..	889	796	203.57	185.68

6. Infant Welfare Centres have been established at Taiping, Ipoh and Kuala Lumpur in connection with the Town Dispensaries. The two former were started in the latter part of the year. That in Kuala Lumpur was opened in April under the charge of a Lady Medical Officer assisted by a European Nursing Sister who had previous experience in Infant Welfare work has proved very successful; the number attending increasing month by month and up to the end of the year there had been 4,076 attendances of women and children. This clinic is now well established and it will soon be necessary to find other accommodation as the Town Dispensary is far too small to deal with all the cases. A Chinese Nurse was engaged towards the end of the year for the purpose of visiting in their homes expectant mothers and those with newly born infants and young children. On the whole she has been well received.

The Women's Hospital, Kuala Pilah, which is under the charge of a Lady Medical Officer with a Nursing Sister to assist her, is also used as an Infant Welfare Centre more particularly by the Malays as is shown by the number of children brought to the out-patient department 2,375 under three years and 1,952 between three and ten.

The Malay Bidans (Midwives) are beginning to show a keen interest in the work done at this hospital. They are allowed to see the routine work of the hospital, including the nursing of patients and the treatment of infants. A great point is made of the importance of cleanliness. A week's course of lectures and training has now been started for all Bidans who care to come. This course of instruction has done much towards removing the prejudice against European Midwifery and the fact that they themselves have seen normal labours conducted in hospital will do much to remove the fear of hospital from the less educated Malay. The observance of those Malay customs which are not detrimental to the patients are allowed but they are also told why certain of their other customs are most injurious.



7. The Infant Welfare Advisory Board held meetings monthly during the year. On its recommendation the Government made provision for the training of Midwives. A start was made by training suitable women at the Chinese Maternity Hospital, and the General Hospital, Kuala Lumpur. The Board also recommended the introduction of a Midwives Bill. This will be brought into force in 1923. On the advice of the Board, estate managers were invited to send suitable women to Government hospitals and group hospitals for a course of training as line ayahs.

Pamphlets on the preventive treatment of ophthalmia neonatorum in various languages were distributed by the Board.

8. The following table shows the deaths and death-rates from the principal diseases for the last twelve years :

Year.	Malaria.		Dysentery and diarrhoea.		Pulmonary tuberculosis.		Beri-beri.	
	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.
1911 ... ..	17,440	17.47	7,659	7.31	2,300	2.20	1,469	1.4
1912 ... ..	17,870	16.52	5,885	5.44	1,353	1.25	1,212	1.12
1913 ... ..	16,414	14.69	5,317	4.75	1,623	1.45	1,190	1.06
1914 ... ..	13,634	11.99	5,235	4.60	1,655	1.45	1,223	1.07
1915 ... ..	15,208	12.97	3,148	2.68	1,995	1.70	871	.74
1916 ... ..	17,627	14.58	3,197	2.64	2,193	1.81	757	.62
1917 ... ..	18,750	15.07	4,942	3.97	2,446	1.96	1,207	.97
1918* ... ..	31,515	24.62	4,280	3.34	3,184	2.48	1,277	.98
1919 ... ..	16,975	12.90	3,712	2.82	2,445	1.86	939	.71
1920 ... ..	20,595	15.24	3,804	2.81	2,634	1.95	431	.32
1921 ... ..	17,168	13.16	2,999	2.30	2,255	1.73	422	.32
1922 ... ..	15,570	11.44	2,419	1.78	2,393	1.76	443	.33

#### INFECTIOUS DISEASES.

9. The country has been remarkably free from any serious outbreak of infectious disease during the past year.

There was a small outbreak of cerebro-spinal meningitis amongst the Malays at the Police Dépôt, Kuala Lumpur, which caused anxiety at the time but prompt measures were taken and no further cases occurred.

No cases of cholera were reported.

The following table shows the total number of cases and deaths occurred during the year :

Diseases.	Perak.		Selangor.		Negri Sembilan.		Pahang.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Cerebro-spinal meningitis ... ..	3	2	10	9	4	4	1	1
Diphtheria ... ..	7	3	6	5	5	1	...	...
Plague ... ..	...	...	1	1	...	...	...	...
Smallpox ... ..	13	1	1	1	2	...	...	...

\* Influenza Epidemic.

## PRINCIPAL DISEASES IN HOSPITALS.

10. The principal diseases commonly treated at the hospitals were malaria, venereal diseases, ankylostomiasis, dysentery, diarrhoea, beri-beri, pneumonia and pulmonary tuberculosis.

The following table shows the number of cases and deaths during the years 1921 and 1922:

Diseases.	Perak.						Selangor.					
	1921.			1922.			1921.			1922.		
	No. of cases.	No. of deaths.	Percentage of deaths.	No. of cases.	No. of deaths.	Percentage of deaths.	No. of cases.	No. of deaths.	Percentage of deaths.	No. of cases.	No. of deaths.	Percentage of deaths.
Malaria ... ..	14,996	860	5.73	12,328	694	5.63	13,397	733	5.47	8,369	413	4.93
Venereal diseases...	2,885	39	1.35	2,248	46	2.05	2,100	22	1.04	2,042	28	1.37
Ankylostomiasis ...	2,400	224	9.33	2,146	172	8.01	1,241	104	8.38	1,057	104	9.84
Dysentery ... ..	1,558	282	18.10	1,580	282	17.85	1,632	406	24.87	1,283	353	27.51
Diarrhoea ... ..	1,039	83	7.99	807	75	9.29	261	35	13.41	299	22	7.35
Beri-beri ... ..	95	22	23.16	169	24	14.20	407	45	11.05	449	64	14.25
Pneumonia ... ..	613	269	43.88	700	320	45.71	611	266	43.53	546	250	45.78
Pulmonary tuber- culosis ... ..	973	484	49.74	990	509	51.42	647	275	42.50	670	307	45.82

  

Diseases.	Negri Sembilan.						Pahang.					
	1921.			1922.			1921.			1922.		
	No. of cases.	No. of deaths.	Percentage of deaths.	No. of cases.	No. of deaths.	Percentage of deaths.	No. of cases.	No. of deaths.	Percentage of deaths.	No. of cases.	No. of deaths.	Percentage of deaths.
Malaria ... ..	6,091	248	4.07	4,007	211	5.26	2,565	102	3.98	1,368	85	6.21
Venereal diseases...	946	8	.84	829	6	0.72	291	3	1.03	193	4	2.07
Ankylostomiasis ...	989	97	9.08	699	55	7.87	527	21	3.98	321	16	4.98
Dysentery ... ..	885	273	30.08	617	171	27.71	207	30	14.49	73	12	16.43
Diarrhoea ... ..	197	17	8.06	114	8	7.02	129	13	10.08	74	11	14.86
Beri-beri ... ..	231	37	16.01	381	36	9.45	76	10	13.15	123	16	13.
Pneumonia ... ..	269	132	49.07	267	137	51.31	126	53	42.07	159	54	33.9
Pulmonary tuber- culosis ... ..	394	164	41.06	426	186	43.66	138	70	50.72	128	60	46.09

  

Diseases.	F. M. S.					
	1921.			1922.		
	No. of cases.	No. of deaths.	Percentage of deaths.	No. of cases.	No. of deaths.	Percentage of deaths.
Malaria ... ..	37,049	1,943	5.24	26,072	1,403	5.38
Venereal diseases...	6,222	72	1.16	5,312	84	1.58
Ankylostomiasis ...	5,157	446	8.65	4,223	347	8.22
Dysentery ... ..	4,282	991	23.14	3,553	818	23.02
Diarrhoea ... ..	1,626	148	9.10	1,294	116	8.96
Beri-beri ... ..	809	114	14.09	1,122	140	12.48
Pneumonia ... ..	1,619	720	44.47	1,672	761	45.51
Pulmonary tuber- culosis ... ..	2,152	993	46.14	2,214	1,062	47.97

## MALARIA.

11. There were 26,072 cases treated in hospitals with 1,403 deaths and a death-rate of 5.38 against 37,049 cases with 1,943 deaths and a death-rate of 5.24 in 1921. These figures show a satisfactory decrease, although the death-rate is a little higher than in 1921.

Free quinine is available and is distributed by the Health Department through District Health Officers to Penghulus, Police Stations and Schools.

On the advice of the Malaria Advisory Board each patient who has suffered from malaria in hospital is given a certain number of tabloids of quinine to take away with him on discharge. This however does not apply to estate labourers who can obtain quinine from the estates.



Cinchona febrifuge is being used in some hospitals and shows good results—in some cases better results than quinine.

Meetings of the Malaria Advisory Board were held monthly during the year. Propaganda articles and notices issued by the Board were published frequently in the local newspapers.

Malaria and malaria prevention is dealt with more fully in the report of the Senior Health Officer attached.

The Malaria Advisory Board had an exhibit at the Malaya-Borneo Exhibition held in Singapore. Types of the common Malayan anophelines were shown. Models and photographs illustrating anti-malarial drainage were also on view. Demonstrations were given.

VENEREAL DISEASES.

12. The total number of cases treated was 5,312 with 84 deaths as compared with 6,222 with 72 deaths in 1921.

The public are slow to take advantage of hospital treatment for venereal diseases. The Venereal Diseases Advisory Board has freely distributed pamphlets and posters urging people to come to hospitals and dispensaries for early treatment.

Injections of novarseno-benzol compounds and mercury for cases of syphilis are given at all Government hospitals. A considerable increase of patients attending for these injections was noticed when it was decided to adopt the method used in the Dutch Indies of charging for each injection to those who could afford to pay. Free treatment for poor people is still given. The chief difficulty is to persuade patients that one or two injections will not cure. After a few injections when the outward and visible signs have disappeared they imagine they are cured and will not trouble to come for more.

The following number of injections of novarseno-benzol compounds were given for syphilis :

Perak	...	...	...	...	...	...	...	...	10,888
Selangor	...	...	...	...	...	...	...	...	6,802
Negri Sembilan	...	...	...	...	...	...	...	...	1,451
Pahang	...	...	...	...	...	...	...	...	549
									<hr/> 19,690 <hr/>

Comparatively few cases of gonorrhoea come for treatment. Fewer cases still will come back for local treatment although willing enough to take medicine.

ANKYLOSTOMIASIS.

13. The total number of cases treated in hospitals during the year was 4,223 with 347 deaths, and a death-rate of 8.22 as compared with 5,157 cases and 446 deaths and a death-rate of 8.65 for 1921.

The routine examination of faeces still shows that ankylostome ova are very common amongst hospital patients.

DYSENTERY AND DIARRHOEA.

14. The total number of cases treated in hospitals was 4,847 with 934 deaths as against 5,908 cases with 1,139 deaths in 1921, a considerable reduction. Although dysentery and diarrhoea rank next to malaria as a cause of death the death-rate for the country in 1922 was 1.78 per mille. The lowest recorded for the last ten years.

BERI-BERI.

15. As was anticipated the number of cases of this disease treated in hospitals shows an increase over 1921 and 1920. The death-rate is however lower than any year since 1914. The following table shows the course of beri-beri in hospitals for the last 13 years :

Year.					Total number of cases.				Total number of deaths.				Percentage of deaths.
1910	...	...	...	...	5,562	...	...	...	532	...	...	...	9.56
1911	...	...	...	...	6,042	...	...	...	695	...	...	...	11.5
1912	...	...	...	...	5,676	...	...	...	657	...	...	...	11.57
1913	...	...	...	...	6,409	...	...	...	716	...	...	...	11.17
1914	...	...	...	...	6,240	...	...	...	686	...	...	...	10.99
1915	...	...	...	...	2,643	...	...	...	333	...	...	...	12.6
1916	...	...	...	...	2,279	...	...	...	322	...	...	...	14.13
1917	...	...	...	...	3,818	...	...	...	609	...	...	...	15.95
1918	...	...	...	...	3,809	...	...	...	646	...	...	...	16.96
1919	...	...	...	...	2,741	...	...	...	398	...	...	...	14.52
1920	...	...	...	...	617	...	...	...	116	...	...	...	18.80
1921	...	...	...	...	809	...	...	...	114	...	...	...	14.09
1922	...	...	...	...	1,122	...	...	...	140	...	...	...	12.48

The Chinese are reverting to the consumption of polished rice now that it is more easily obtainable. The Senior Medical Officer, Perak, reports that Malays are acquiring a taste for this form of rice in preference to their own much more wholesome rice.

There is little doubt but that the shortage and the control of rice during the war had a great effect on the incidence of this disease. Polished rice being not so easy to obtain drove the Chinese to other food-stuffs with the result that beri-beri decreased.

Polished rice is now plentiful and unfortunately it is cheaper than undormilled or parboiled rice. So it is more commonly used. Polished rice has also a more attractive appearance than undermilled or parboiled.

By propaganda it is hoped to warn the people of the danger of polished rice as compared with undermilled but undermilled rice should be freely obtainable and an effort should be made to put it on the market at as cheap or cheaper rate than polished.

Extract of rice polishings made by the Institute for Medical Research is now freely used in the treatment of beri-beri cases. It is especially useful in acute cases and undoubtedly tends to shorten the course of the disease.

#### PULMONARY TUBERCULOSIS.

16. The total number of cases treated in hospitals during the year was 2,214 with 1,062 deaths and a death-rate of 48.05 as compared with 2,152 with 993 deaths and a death-rate of 46.14 for the year 1921, distributed as follows :

States.	1921.			1922.		
	Cases.	Deaths.	Per-centage.	Cases.	Deaths.	Per-centage.
Perak ... ..	973	484	49.74	990	509	51.42
Selangor ... ..	647	275	42.50	670	307	45.82
Negri Sembilan ... ..	394	164	41.06	426	186	43.66
Pahang ... ..	138	70	50.72	128	60	46.09
Total ...	2,152	993	46.14	2,214	1,062	47.97

The mortality rate is high as those suffering from this disease almost always seek admission only when they are in an advanced stage.

Consequent on the reports received during August, 1922, of cases of tuberculosis amongst subordinates in Government offices, arrangements have been made for the examination of every individual at least once a year.

The notification of cases of pulmonary tuberculosis has been introduced in certain Sanitary Board areas.

#### YAWS.

17. During 1922 the treatment of cases of yaws by means of injections of novarseno-benzol compounds was continued.

The number of cases treated in each State is shown in comparison with the number treated in 1921 in the following table :

States.	1921.	1922.
Perak ... ..	8,547	11,474
Selangor ... ..	578	1,700
Negri Sembilan ... ..	2,179	3,749
Pahang ... ..	903	6,049
Total ...	12,207	22,972

The figures show a large increase for each State. I attribute this satisfactory result partly to improved organization but chiefly to the fact that the treatment, which the benefits derived from it, is appreciated by the Malays who are the chief sufferers from this disease. Now that it is better known they come long distances to hospital instead of having to be sought for in their kampongs.



The chief trouble we have to contend with is to try and persuade patients to come for a second or third injection. The result from one injection is usually so striking that they are satisfied they are cured. Consequently few come a second time and many will not come to be inspected. It would be far more satisfactory if they could be persuaded to come and report themselves and receive further injections if necessary.

The number of injections given in 1922 was 30,492 as against 22,972 in 1921.

The campaign against yaws during the past two years has justified itself. In certain districts the local Malays report that whereas two or three years ago a quarter or half of their neighbours were affected, there are now only one or two in a hundred. This may possibly be an exaggeration but there is no doubt that yaws is becoming so uncommon in certain districts, which were efficiently dealt with in 1921, that it is almost impossible to find a case even by a house to house inspection.

In 1921 the number of cases was ascertained by requesting the District Officers to forward lists of cases which had been made up by the Penghulus. In 1922 these lists, more particularly in Perak and Pahang, were prepared by sending a Malay Dresser to the various kampongs to take a census of cases. This Dresser was instructed to explain to the people the dangers of the disease and its highly contagious character. He also explained the benefits which would be derived by treatment. The visit of the Dresser was followed up by a visit by the Medical Officer or Assistant Surgeon to a suitable place arranged with the District Officer and the Penghulu was instructed to produce the cases previously notified. This method worked well and the Malays came freely for treatment.

#### INFLUENZA.

18. A mild type of this disease occurred during the year. There were 1,653 cases with 46 deaths as compared with 1,784 cases with 51 deaths in 1921, distributed as follows :

States.	1921.			1922.		
	Cases.		Deaths.	Cases.		Deaths.
Perak ... ..	190	...	8	547	...	7
Selangor ... ..	1,096	...	14	806	...	19
Negri Sembilan ... ..	360	...	16	227	...	13
Pahang ... ..	138	...	16	73	...	7
Total ... ..	1,784	...	51	1,653	...	46

#### EYE DISEASES.

19. A clinic was started at the Ipoh Hospital under the charge of the Ophthalmologist Dr. P. H. Hennessy. There is an out-patients department and a ward of ten beds. Similar arrangements exist at Taiping Hospital with Assistant Surgeon Abraham in charge. One thousand two hundred and seventy-eight cases have attended. The principal diseases were conjunctivitis, trachoma, cataract and glaucoma. Trachoma accounted for 224 cases and is quite the commonest eye condition amongst the Chinese. Sixty-seven cases with 58 successes were operated on for cataract.

#### OPERATIONS.

20. The total number of operations undertaken during the year under review is as shown below :

States.	Major.			Minor.		
	1921.	...	1922.	1921.	...	1922.
Perak ... ..	362	...	404	1,475	...	1,901
Selangor ... ..	273	...	293	1,343	...	1,174
Negri Sembilan... ..	62	...	68	1,201	...	1,024
Pahang ... ..	10	...	16	210	...	329
Total ... ..	707	...	781	4,229	...	4,428

The Chief Surgeons are stationed in Kuala Lumpur and Ipoh but are available for operations in hospitals in other districts. Many interesting cases have been operated on and the results have been on the whole successful. The Chief Surgeon, Ipoh (Dr. C. B. Pasley), reports a method of preparing wire for wiring of fractures which he has used successfully. Ordinary ladies hat wire (which can be obtained in various thickness in any draper's shop) stripped of its cotton covering, polished with sand paper, heated to red heat in a spirit lamp flame, then immersed in cold water, repolished and placed in spirit. This treatment renders the wire exceedingly pliable and it can be tied in a knot. It is most adaptable in irregular surfaces and angles such as are met with in long bones. Its tensile strength is great and its cost almost nil. It does not seem to have any irritant effect on the tissues provided asepsis be maintained. It should replace the more costly and much less pliable silver wire.

#### INDOOR PATIENTS.

21. The total number of in-patients treated in all hospitals and institutions throughout the Federated Malay States during the year was 92,690 with 7,334 deaths and a death-rate of 7.91 per cent. as compared with 116,785 cases with 8,294 deaths and a death-rate of 7.10 per cent. in 1921.

The distribution of patients in the different States is shown below :

States.	1921.			1922.		
	Cases.	Deaths.	Death-rate.	Cases.	Deaths.	Death-rate.
Perak ... ..	49,647	3,594	7.24	42,567	3,350	7.87
Selangor ... ..	40,159	2,840	7.07	30,455	2,419	7.94
Negri Sembilan ... ..	19,030	1,378	7.24	14,417	1,149	7.97
Pahang ... ..	7,949	482	6.06	5,251	416	7.92
Total ...	116,785	8,294	7.10	92,690	7,334	7.91

The total treated shows a decrease in every State as compared with last year. This is chiefly due to the policy of refusing admission to minor cases, and of treating cases wherever possible as outdoor patients.

#### OUTDOOR PATIENTS.

22. The number of out-patients treated by all hospitals and dispensaries for 1922 was 433,111 as compared with 329,310 for 1921, distributed as follows :

States.	1921.	1922.
Perak ... ..	107,186	150,157
Selangor ... ..	100,433	128,806
Negri Sembilan ... ..	66,842	81,711
Pahang ... ..	54,849	72,437
Total ...	329,310	433,111

#### TOWN DISPENSARIES.

23. These institutions have proved a great success and the number of out-patients attending shows a satisfactory increase.

In towns where these dispensaries are open the number of out-patients attending hospital has fallen off to a certain extent as many patients apparently prefer the smaller institution which is situated as near as possible to the more thickly populated area of the town.

The Town Dispensaries in Kuala Lumpur, Ipoh and Taiping are also used as Infant Welfare Centres but as the attendances at these centres increase, as they show every likelihood of doing, it will become necessary to separate and remove the Infant Welfare Centres to larger buildings.

#### MOTOR AMBULANCES.

24. Five Ford ambulances were restarted towards the end of the year and resumed their travelling dispensary work. These ambulances provide a very satisfactory means of getting into touch with the sick in outlying villages and kampongs and it is hoped that their number will be increased as they undoubtedly do good work. They are very useful in dealing with the yaws campaign and in the inspection of outlying schools and Public Works Department cooly lines. They are also used to bring cases into hospital.

Five Sunbeam ambulances stationed at Kuala Lumpur, Taiping, Ipoh, Seremban and Raub are also used for transporting sick to hospital.



## VACCINATIONS.

25. During 1922, the total number of vaccinations performed was 65,201 against 68,280 in 1921, distributed as follows:

States.	1921.	1922.
Perak ... ..	44,036	43,644
Selangor ... ..	11,468	12,054
Negri Sembilan ... ..	9,510	5,422
Pahang ... ..	3,266	4,081
Total ...	68,280	65,201

The number of cases vaccinated compare favourably with the number of births during the year.

Centres are chosen in co-operation with District Officers and notice thereof given to parents. Failure to attend is common. In Negri Sembilan alone, there were 208 prosecutions during the year.

The number of cases vaccinated in Perak and Negri Sembilan shows a decrease, which was due to the fact that there was no outbreak of smallpox as occurred in 1921 to give the opportunity of vaccinating adults.

In Pahang it was observed that the child population was, to a certain extent, unvaccinated and with a view of rectifying this evasion of vaccination, strict enforcement was introduced in July last.

## WOMEN'S HOSPITALS AND WARDS.

26. Lady Medical Officers are stationed at the District and General Hospitals, Kuala Lumpur, Kuala Kangsar, Ipoh, Kuala Pilah and Pekan.

## WOMEN'S HOSPITAL, KUALA KANGSAR.

27. This hospital is under the charge of Dr. L. M. Bush, Lady Medical Officer. The total number of indoor cases treated during the year was 956 as compared with 1,007 during 1921 and 1,095 in 1920. Forty indoor and 35 outdoor maternity cases were attended to in this hospital during the year.

## MATERNITY DEPARTMENT, IPOH.

28. Dr. L. J. Murphy, Lady Medical Officer, is in charge. One hundred and fifteen maternity cases were attended to as compared with 77 in 1921.

## WOMEN'S HOSPITAL, KUALA PILAH.

29. This hospital is under the charge of Dr. E. M. M. Cobb, Lady Medical Officer. The total number of in-patients treated during the year was 1,266 as against 710 in 1921. The increase is very marked since 1920 during which year the number of in-patients was 433.

*Out-patients.*—The total number of out-patients was 7,961 as against 6,443 in 1921, and 2,185 in 1920.

That this hospital is regarded by Malays and other nationalities as an Infant Welfare Centre is shown by the number of children brought to the out-patients department. The work done at this hospital in connection with Infant Welfare and the training of Bidans is referred to under Infant Mortality.

## FEMALE AND MATERNITY WARDS, GENERAL HOSPITAL, KUALA LUMPUR.

30. These have been under the care of the Lady Medical Officer, Dr. E. B. Jacques, since 5th February, 1922.

The total number of women treated was 1,216 with 102 deaths, a death-rate of 8.2 per cent. as against 1,416 with 112 deaths, and a death-rate of 7.9 per cent. in 1921.

*Children's Department.*—Three hundred and seventy-eight children under 12 years of age were treated as in-patients of which 72 died as against 385 with 60 deaths in 1921.

*Maternity Department.*—Two hundred and ninety-nine cases were admitted with 16 deaths, giving a percentage of 6.9 per cent. as against 245 cases with 15 deaths, a percentage of 6.11 in 1921.

## FEMALE WARDS, DISTRICT HOSPITAL, KUALA LUMPUR.

31. Dr. M. J. Ahern, Lady Medical Officer, is in charge of these wards. Two hundred and sixty-six patients were admitted into Chinese Women's Ward, the majority of the cases were malaria, dysentery and ankylostomiasis. Some cases of tetanus neonatorum were admitted, all in an advanced stage and proved fatal. Judging from the number of cases seen here, in the Convent and in the town, tetanus neonatorum must take no small place in the high death-rate among infants.

There has been an increase in the number of very small children admissions for some months past, cases discovered at the Infant Welfare Centre in Kuala Lumpur being brought to hospital for treatment.

Four hundred and ninety patients were admitted into the Tamil Women and Children's Ward. Malaria, ankylostomiasis and dysentery were the prevalent diseases.

## MALAY WOMEN'S WARD, PEKAN.

32. Dr. Miss A. G. Fergus, Lady Medical Officer, is in charge. During the year the women's ward and out-patient department has been separated from the District Hospital and the Lady Medical Officer has been placed in full charge.

The total number of cases treated both as in-patients and out-patients was 1,747. Two hundred visits were paid to patients' houses.

## MALAY HOSPITAL, KUALA LUMPUR.

33. *Female Ward*.—This is under the charge of the Lady Medical Officer, Dr. Ahern. One hundred and twenty-nine patients were admitted, the majority of the patients were cases of venereal disease or yaws. This ward was generally full.

## GAOL HOSPITALS.

34. During 1922, the general health of the prisoners and the sanitation have been satisfactory.

The chief diseases prevalent were malaria, dysentery, diarrhoea and ankylostomiasis.

The total number of cases treated during the year in the different gaol hospitals was 1,736 with 29 deaths, and a death-rate of 1.67 as against 2,205 cases with 65 deaths, and a death-rate of 2.95 for 1921, distributed as follows:

Place.	1921.			1922.		
	Cases.	Deaths.	Per-centage.	Cases.	Deaths.	Per-centage.
Pudu Gaol, Kuala Lumpur ...	588	19	3.23	421	5	1.18
Gaol, Taiping ...	672	26	3.86	604	17	2.81
„ Batu Gajah ...	559	12	1.93	348	3	.08
„ Papan ...	34	1	2.94	65	2	3.06
„ Seremban ...	309	7	2.26	240	2	.82
„ Kuala Lipis ...	43	...	...	15	...	...
„ Kuantan ...	...	...	...	43	...	...
Total ...	2,205	65	2.95	1,736	29	1.67

## INSPECTION OF SCHOOLS.

35. This was continued throughout the year. Owing to a certain amount of overlapping which occurred in 1921 a scheme was drawn up by which the inspection was divided up between the Medical Branch and the Health Branch. Certain schools were assigned to Health Officers and the others to Medical Officers or Lady Medical Officers. In Pahang, however, the Medical Branch inspected all the schools.

A report by the Inspecting Officer on each school visited was forwarded to the Senior Medical Officer and the Inspector of Schools of the State concerned as well as to the Senior Health Officer, Federated Malay States.

Simple medicines and quinine were distributed to the schoolmasters in outlying schools. In places where the motor ambulances were running the Dresser paid visits to schools near the road.

The health of the scholars is reported to be generally satisfactory with the exception of a few schools where malaria, enlarged spleen, scabies and anaemia have been found.

In certain schools, more particularly in outlying districts, the sanitation and water supply are not generally satisfactory.



## LEPER ASYLUM.

## KUALA LUMPUR.

36. This Asylum was under the charge of the Medical Officer, District Hospital, till April 6th on which date Dr. Travers took over charge.

The conditions of this Asylum at the beginning of the year were far from satisfactory. On January 6th a riot occurred amongst the lepers and the Medical Officer in charge was assaulted. A large force of Police was called in and after some trouble the lepers were brought more or less under control. During the outbreak and before the Police arrived a number of lepers escaped having burst open the gate when the watchman ran away. Later in the year the Dresser who had been in charge of this Asylum for a number of years was discovered to be stealing chandu which was supplied for the use of the lepers. He was suspended from duty and put under arrest. Later he was brought to trial, convicted and sentenced to three months' rigorous imprisonment. There is little doubt but that he had been defrauding the Government and the lepers for some considerable time and it is probable that some of the ring leaders amongst the lepers had been sharing in the plunder.

The Asylum has been entirely reorganized and is now in a fairly satisfactory state. A Eurasian, who is himself a leper, has been appointed Steward. He has done invaluable work and has the lepers of all nationalities under his control. There are no non-lepers employed at the Asylum.

The public has subscribed to a "Lepers Aid Fund" with the object of providing comforts and amusements for the inmates. Musical instruments, etc., have been bought. Anyone visiting the Asylum now can listen to a band which the lepers amuse themselves with. Seventy lepers from this Asylum were transferred to Pulau Jerejak during 1922. Most of the ring leaders of the riot were included.

## PULAU PANGKOR LAUT.

37. This Asylum is on an Island near Lumut and is only for Malays. It has an accommodation for 57 lepers. The present number is 36 males and 22 females. Fourteen new cases were admitted during the year. There were eleven deaths.

## LEPER WARD, TAIPING.

38. The two receiving wards at the District Hospital compound, one for males and the other for females, have an accommodation of 45 and 12, respectively.

Only 33 cases remained at the end of the year as compared with 78 at the beginning. Eleven females and 22 males. One hundred and thirteen cases were admitted during the year, 118 transferred and 11 died.

## PULAU JEREJAK.

39. This Asylum is under the charge of the Straits Settlements. During the year 187 lepers have been transferred from the Federated Malay States to this Asylum which now has a total of 253 F.M.S. lepers.

## TREATMENT OF LEPROSY.

40. The E.C.C.O. or the ethyl esters of chaulmoogra, camphor and creasote treatment has been carried out with good results.

The E.C.C.O. intravenous or intramuscular injection is the chief treatment adopted. This treatment gives very encouraging results though it is difficult to state definitely that the disease can be cured by this means. Some reaction is shewn after the injection which at first discourages the patient from persevering in the treatment but many of the patients now realize that they improve under treatment and it is becoming more popular. Two cases at Pulau Pangkor Laut have shewn such improvement that it is hoped that it will soon be possible to discharge them from the Asylum. The progress of the disease has been arrested and they are no longer in an infective condition.

It will be necessary, however, to keep them under observation for some time to come.

Cases with bad ulceration have been treated with tartar emetic. One grain in 10 c.c. of the distilled water has been injected twice weekly. The results have been most encouraging.

## GOVERNMENT MEDICAL INSTITUTIONS, F.M.S.

41.

States.	Hospitals.	Estate hospitals and dispensaries.	Gaol hospitals.	Men tal hospitals.	Leper Asyla.	Dispen-saries.	Vagrant and decrepit wards.
Perak ... ..	23	2	3	1	2	8	2
Selangor ... ..	10	...	1	...	1	7	2
Negri Sembilan	9	...	1	...	...	3	...
Pahang ... ..	5	1	2	...	...	6	...

Four small hospitals were closed during the year but dispensaries kept open.

## X-RAY AND ELECTRICAL DEPARTMENT.

42. This was under the charge of Dr. H. Mowat, Radiologist. The attendances show an increase of over a third as compared with 1921. Figures for 1922:

Radiant heat treatment	...	...	...	...	...	...	254
Electrical treatment	...	...	...	...	...	...	996
X-ray treatment	...	...	...	...	...	...	109
Screen examinations	...	...	...	...	...	...	33
„	„	with radiogram	...	...	...	...	481
Total							1,873

## VETERINARY DEPARTMENT.

## RINDERPEST.

43. There were two outbreaks of rinderpest amongst buffaloes at the Malayan Collieries, Batu Arang, during the year, the first outbreak during January and February, and the second during April, May and June, 1922.

Two small outbreaks occurred at Tampin.

There were altogether 51 cases with 46 deaths, distributed as follows:

	Cases.	Deaths.	Destroyed.
Batu Arang in Selangor ... ..	45	40	2
Tampin in Negri Sembilan ... ..	6	6	—
Total ... ..	51	46	2

The States of Perak and Pahang were free from this disease during the year under review.

## FOOT-AND-MOUTH DISEASE.

44. An outbreak of this disease occurred at Kroh in September, 1922, amongst cattle imported from Kedah, affecting a total number of 879 cases with six deaths.

There were nine cases at Selama with no deaths.

There were eight cases amongst the cattle imported into Selangor from India.

There were two small outbreaks at Rahang village and Gedong Lallang in Negri Sembilan; the disease was of a mild type and its spread was stopped by quarantine of the affected area.

The following table shows the total number of cases and deaths:

	Cases.	Deaths.	Destroyed.
Kroh in Perak ... ..	879	6	—
Selama in Perak ... ..	9	—	—
Port Swettenham in Selangor ...	8	—	—
Rahang village in Negri Sembilan ...	10	—	—
Gedong Lallang in Negri Sembilan ...	15	—	—
Total ... ..	921	6	—

The State of Pahang was free from this disease.



## RABIES.

45. Rabies appeared amongst dogs in Kuala Lumpur during February, this being the sixth successive year in which the disease has occurred in Kuala Lumpur.

Seven definite cases and two suspected cases came under observation during the year, and the muzzling order was still in force at the end of the year in the Kuala Lumpur area.

Since August last the muzzling order has been more vigorously enforced by the Police Department with Mr. Toft in charge of the dog-shooters and a large number of unlicensed dogs are reported to have been destroyed. Arrangements were being made during the year for any stray unmuzzled dogs, which could be captured, to be brought to the Animal Infirmary for detention and observation.

All dogs which were known or suspected to have been bitten by a rabid dog were destroyed.

## PLEURO-PNEUMONIA.

46. There were nine outbreaks in Perak of this disease during the year, affecting 541 cases with 233 deaths.

The other three States were free from this disease.

## SWINE FEVER.

47. There was an outbreak near Seremban, 58 cases with 23 deaths and 35 destroyed. There was another small outbreak in Pahang, amongst a shipment of pigs from Siam, there were 17 cases with 14 deaths and 3 destroyed. The States of Perak and Selangor were free from this disease.

48. The following table shows the total number of cases, deaths, etc., from infectious diseases, during 1922:

Diseases.	Perak.			Selangor.			Negri Sembilan.			Pahang.			Total.		
	Cases.	Deaths.	Destroyed.	Cases.	Deaths.	Destroyed.	Cases.	Deaths.	Destroyed.	Cases.	Deaths.	Destroyed.	Cases.	Deaths.	Destroyed.
Rinderpest ... ..	...	...	...	45	40	2	6	6	...	...	...	...	51	46	2
Foot-and-mouth...	888	6	...	8	...	...	25	...	...	...	...	...	921	6	...
Surra ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rabies ... ..	...	...	...	9	8	1	...	...	...	...	...	...	9	8	1
Swine fever ... ..	...	...	...	...	...	...	58	23	35	17	14	3	75	37	38
Pleuro-pneumonia ... ..	541	233	...	...	...	...	...	...	...	...	...	...	541	233	...

## VETERINARY QUARANTINE STATIONS.

49. *Port Swettenham*.—Six thousand one hundred and fifteen animals passed through this quarantine station, of which number 2,101 cattle were quarantined for ten days.

*Bukit Sentul*.—Ninety-six cattle were quarantined here, these being mostly cattle imported by train. Fourteen buffaloes which escaped from Batu Arang during the rinderpest outbreak at that place were brought to Bukit Sentul, and of these seven died of rinderpest and seven were slaughtered for food before becoming infected.

*Kuala Kubu*.—Seventy-nine cattle from Serendah were quarantined here and inoculated with anti-rinderpest serum.

*Kuantan*.—The total number of animals passed through this station was 1,550.

*Perak*.—The total number of animals passed through the following stations is as follows:

Port Weld ... ..	987
Parit Buntar ... ..	374
Selama ... ..	669
Upper Perak ... ..	252
Telok Anson ... ..	390
Total ... ..	2,672

*Negri Sembilan*.—One hundred and thirteen animals were passed through the quarantine stations.

## VETERINARY PRECAUTIONS.

50. There were 1,298 prosecutions resulting in 1,234 convictions as detailed below :

States.	Cases.	Convictions.	Fines.
Perak ... ..	600	565	\$6,995
Selangor ... ..	491	470	4,317
Negri Sembilan ... ..	133	125	960
Pahang ... ..	74	74	576
Total ...	1,298	1,234	\$12,849

## FINANCE.

51. The total revenue collected during the year was \$232,838, distributed as follows :

Principal Medical Officer ... ..	\$ 430
Perak ... ..	71,159
Selangor ... ..	68,187
Negri Sembilan ... ..	23,863
Pahang ... ..	7,107
Director of Government Laboratories ... ..	782
Senior Health Officer ... ..	1,583
Central Mental Hospital ... ..	59,724
Total ...	\$232,838

## EXPENDITURE.

52. During 1922, the total actual expenditure under personal emoluments and other charges amounted to \$2,571,606.

## STAFF.

## APPOINTMENTS.

53. The following officers were appointed during the year. Dr. F. E. Wood was appointed Senior Medical Officer, Perak, with effect from 1st January, 1921. From 5th April, 1922, he acted as Principal Medical Officer, Federated Malay States, vice Dr. R. Dowden on long leave.

Dr. D. Bridges was appointed Senior Medical Officer, Selangor, with effect from 1st January, 1922, and he was subsequently transferred to Kedah as State Surgeon, with effect from 1st July, 1922.

Dr. A. K. Cosgrave was appointed Acting Senior Health Officer, Federated Malay States, with effect from 13th May, 1922, during the absence on long leave of Dr. A. R. Wellington, and was subsequently appointed Senior Medical Officer, Selangor, with effect from 1st July, 1922.

Dr. D. T. Skeen's appointment as Senior Medical Officer, Negri Sembilan, was sanctioned with effect from 6th May, 1921.

Dr. I. P. Masters acted as Senior Medical Officer, Pahang, with effect from 29th April, 1922.

Dr. W. H. Hart acted as Senior Medical Officer, Perak, with effect from 13th May, 1922.

Dr. W. M. Chambers acted as Senior Medical Officer, Selangor, with effect from 1st October, 1922, during the absence of Dr. A. K. Cosgrave who was acting as Senior Health Officer, Federated Malay States.

Dr. J. L. Gregory, a newly appointed Health Officer from Europe, was appointed Health Officer, Selangor East, with effect from 3rd November, 1922.

## NURSING SISTERS.

54. The following were appointed during the year :

Miss F. B. Pearn was appointed Matron, General Hospital, Kuala Lumpur, with effect from 31st August, 1922, vice Miss A. E. Fletcher, retired.

Misses C. Kemp, 11th November, 1922; L. M. Midgley, 17th November, 1922; H. S. Cooper, 17th November, 1922; E. M. McIlrath, 9th December, 1922; M. H. Armour, 23rd December, 1922.



## RESIGNATIONS.

55. Dr. I. W. Bourke, a locally engaged Medical Officer, resigned the service on 4th April, 1922.

Dr. J. E. Thomson, a locally appointed Health Officer, resigned the service on 21st May, 1922.

Dr. O. J. Murphy, Medical Officer, resigned the service on 1st March, 1922.

Dr. H. Savage, Health Officer, Selangor, resigned the service on 28th February, 1922.

Mr. H. W. McCutcheon, a locally engaged temporary Steward resigned the service on 27th February, 1922.

Miss L. M. Whellan, Nursing Sister, terminated her services on 3rd June, 1922, on the expiration of her agreement with this Government.

Misses Hardcastle, M. Hawthorn and E. M. Hall's services terminated on 19th September, 1922, 18th October, 1922, and 19th October, 1922, respectively, on the completion of their agreements.

Misses V. L. Spark, D. F. E. Seaman, H. Parsons, A. M. Webster and J. Leslie resigned the service on 28th February, 1922, 30th June, 1922, 21st July, 1922, 29th August, 1922, and 17th September, 1922, respectively.

## TRANSFERS.

56. Dr. C. L. Stewart, Medical Officer, was transferred to Johore with effect from 1st April, 1922.

## RETIREMENT.

57. Dr. W. S. Milne was placed on temporary pension with effect from 18th April, 1922.

Dr. H. M. C. Green was retired on pension with effect from 30th March, 1922. It is with the deepest regret that his death on 10th May, 1922, is noted.

Miss M. W. Jepps' services terminated with effect from 4th October, 1922, on the expiration of her agreement.

Miss A. E. Fletcher, Head Sister, retired on 1st December, 1922.

58. The following reports are attached as appendices :

A.—Report of the Malaria Bureau.

B.— „ Director of Government Laboratories.

C.— „ Chemical Section of the Laboratories.

D.— „ Senior Health Officer, Federated Malay States.

E.— „ Medical Superintendent, Central Mental Hospital, Tanjong Rambutan.

27th March, 1923.

F. E. WOOD,

*Acting Principal Medical Officer, Federated Malay States.*

## MALARIA BUREAU ANNUAL REPORT, 1922.

Monthly reports on the progress of work have been issued and the present report is a review of the subjects mentioned in those reports.

## FIGURES RELATING TO FIELD AND LABORATORY WORK.

Figures showing the amount of material collected and dealt with in the laboratory appear in each of the monthly reports and the following are the total figures for the year:

Breeding places described	...	...	...	...	941
Larvae identified microscopically	...	...	...	...	71,421
Adults bred out and identified	...	...	...	...	23,621
Adults caught in houses	...	...	...	...	10,327
Adults tested for egg-laying capacity	...	...	...	...	1,257

## SEASONAL BREEDING OF ANOPHELINES.

Observations were continued throughout the year to determine whether the various species had a definite breeding season or whether they are capable of breeding all the year round.

Adults of each of the following species, *A. vagus*, *A. aconitus*, *A. barbirostris*, *A. hyrcanus* and *A. fuliginosus*, were bred out from larvae during each month of the year; but this breeding out from larvae does not necessarily prove that the species mentioned are breeding throughout the year since there may be a latent period in the development of larvae. For example, in last year's report it was shown that *A. asiaticus* larvae could remain dormant for as long as 163 days and still hatch out.

No direct experiment on breeding can be made with anophelines because they will not breed in captivity as other mosquitos, notably *Stegomyia*, will do. But by testing the egg-laying capacity of females caught already fertilised, it has been found that *A. vagus* and *A. aconitus* do lay fertile eggs throughout the year, and the larvae of these species also hatch out throughout the year as shown above.

As emphasised in last year's report only positive results have any value in this part of the work since so much depends on the readiness with which suitable material, that is, well developed larvae and fertilised females of the different species, can be obtained. There is good evidence that at least the two common species, *A. vagus* and *A. aconitus*, do breed throughout the year, but there is no evidence as to whether the breeding is more prolific at any one period of the year.

The work described in the next section of this report was done to find out whether there is an increase of certain species at certain times of the year, and if so whether this increase depends on breeding habits inherent in the species or upon the environment becoming suitable for its breeding.

## SEASONAL PREVALENCE OF SPECIES.

Of the five places chosen by Dr. Lamborn for the study of this subject, only in three did the conditions remain sufficiently constant for reliable results to be obtained. These three places were the Malaria Advisory Board's cooly lines, the house on Petaling Hill and the Fish-pond at Pudu. Routine collections were made from each of these places and the results obtained month by month are given in the Appendix, Tables I-III.

For studying the relation which these results bear to the rainfall of the district, the records from the gaol and the Weld Hill rain-gauges afford the best data, since these two stations are close to the collecting grounds. Table IV shows the monthly rainfall recorded at each of these stations, also the average between the two; and this average is taken for correlating the rainfall with the mosquito catches.

Figures in tables, however, convey little meaning until they are plotted in graphic form showing the relation of one set of figures to another. The accompanying chart shows curves based on the monthly percentage of small pool breeders at each of the observation stations. The inverse of these curves represents the swamp breeders and shade breeders; but the shade breeders are so few in number that they exert no appreciable influence on the course of the curves, and the inverse of the curves may be taken to represent for practical purposes the proportion of swamp breeders. It follows therefore that a separate chart is not necessary for plotting the swamp breeders since a fall in a curve indicates an increase in the swamp breeders, and a rise in a curve indicates a decrease.



The chart incorporates, in addition to this year's figures, the figures already published in last year's report. The monthly rainfall, which is plotted in black, is based on the average rainfall given in Table IV, and the results from each of the observation stations is plotted in a different colour, viz.:

*Yellow.*—Adult anophelines caught at the Malaria Advisory Board's cooly lines.

*Red.*—Adult anophelines caught at Petaling Hill.

*Green.*—Anopheline larvae caught at Pudu Fish-pond.

In the following discussion of the results the curves will be referred to by their colour when this procedure leads to brevity and clearness.

*Yellow Curve.*—The yellow curve, for the Malaria Advisory Board's cooly lines, shows a steady rise in small pool breeders, and a steady fall in swamp breeders till they completely disappear in October, 1921. This disappearance of swamp breeders may be accounted for by the drainage undertaken at the end of 1920 which affected about 80 acres in the vicinity of the cooly lines. Portions of this area were occupied by vegetable gardeners during 1921, and the decrease of swamp breeders is probably due to this drainage and cultivation. This explanation of the disappearance of swamp breeders is confirmed by their reappearance in wet weather as shown on the Chart by the fact that the two falls in the yellow curve, indicating increases in swamp breeders, are accompanied by the two rises on the rain curve marked III and V, respectively, indicating periods of wet weather.

*Red Curve.*—The red curve for the house on Petaling Hill also shows a general rise in small pool breeders throughout the year, and this may be a result of the drainage which affected the Malaria Advisory Board's cooly lines, combined with the result of general reduction of swamps in the neighbourhood. The most striking features of the curve, however, are the four peaks marked, for reference, I, II, III and IV.

Two of these, I and III, are minor peaks and two, II and IV, major peaks. The minor peaks coincide with the end of the periods of heavy rainfall marked I and III on the rain curve and fall rapidly with the onset of dry weather. These are probably due to the increase of casual small pools during wet weather. The major peaks, II and IV, rise during periods of low rainfall and fall when the rain curve rises in the latter part of each year. They probably represent the increase in breeding of small pool breeders in swamps during dry weather, and this increase in breeding may result from (1) the drying up of casual pools elsewhere which might force these species to breed in swamps; from (2) the formation of small pools in swamps during drought; and also, possibly, from (3) the water in swamps becoming more suitable to small pool breeders during dry weather. The peaks I and III must be regarded as the typical increase of small pool breeders depending on the increase of casual small pools in wet weather, and II and IV as the increase typical of the effect of drought in swampy areas. The fact that II and IV are so much greater than I and III indicates that most of the specimens caught here come from swampy areas. This accords with the explanation given above that the gradual increase of small pool breeders is due to the gradual reduction of swamps, since the effect of reduction of swamps would not be evident unless many of the specimens came from swampy areas.

*Green Curve.*—The green curve for the larvae caught in the Pudu Fish-ponds shows a surprising resemblance to the curve for the adults caught on Petaling Hill, but at the same time it shows some very suggestive differences. The same general upward tendency of the curve, indicating increase of small pool breeders, is noticeable, and is also probably due to the gradual elimination of swamp breeders following drainage, and the filling and oiling, of swamps. The four peaks seen correspond with those on the Petaling Hill curve and they are marked with corresponding numbers, but there are important differences in regard to their relation in size and in time. The minor peaks I and III correspond with the minor peaks on the Petaling Hill curve but they are smaller, whereas the major peaks II and IV are larger than their corresponding peaks on the Petaling Hill curve. Moreover there are differences in time, especially noticeable in 1922, thus peak III occurs later, as well as being smaller, than peak III on the red curve; whereas peak IV, in addition to being larger than peak IV on the red curve, occurs distinctly earlier. These facts are highly suggestive, they seem to indicate that I and III result from the corresponding peaks on the red curve, but that II and IV cause their corresponding red peaks. If the previous explanation of peaks I and III on the red curve is correct, peaks I and III on the green curve might well represent the larvae resulting from the increase of adults bred out from their typical habitat, i.e., small pools; and II and IV on the green curve may be the increase of larvae due to swamps and large pools becoming suitable for small pool breeders, and thus the cause of the corresponding increases in adults on the red curve.



*Conclusions.*—At the present stage it is impossible to base definite conclusions on the work in hand, but certain temporary deductions can be made. In last year's report it was stated that "no definite correlation between species and the rainfall could be established" and the main reason for this statement was that there were two increases in small pool breeders, one of which occurred in the wet and the other in the dry period of the year. But when the results of this year are added to those of last year it is seen that these increases in small pool breeders recur in a regular manner, and reasons for them occurring in the way they do have been suggested above. These reasons will form the hypothesis to be tested by the results to be obtained during 1923, and they will be confirmed if the results are similar to those obtained during the two previous years, which are first two years of the present research.

Such temporary deductions as can be made at present may be described as partly of local interest and partly of general application. Of local interest would be the deductions that the mosquitos caught at the observation stations come mainly from swampy areas, and that the gradual increase of small pool breeders and decrease of swamp breeders depends on the effect of the progressive treatment (drainage, filling and oiling) of swamps in the neighbourhood. Deductions of more general interest would be that there is a rise of small pool breeders during wet weather due to the increase of casual pools, but that in swampy country the small pool breeders increase during dry weather. A more general deduction, which will emerge if the results remain constant, is that increase in breeding of a species depends on the local conditions becoming suited to that species rather than on its having any definite breeding season.

#### WORK AT CAMPBELL ROAD SWAMP.

Dr. Lamborn also chose this swamp as a place for routine observations on larvae, and the huts on the banks of the swamp for routine collections of adults. Much filling and building occurred in the neighbourhood and in September the Health Department found it necessary to clear and oil the swamp. This, besides making it increasingly difficult to obtain collections, so altered the conditions that the results became useless for studying seasonal variation in species; but some of the results are of interest and are recorded.

The following table compares the larvae collected in the swamp during 1922 with those collected in the previous year:

Species.				1921. Total specimens 30,439.		1922. Total specimens 23,256.
SWAMP BREEDERS.—						
<i>A. barbirostris</i>	...	...	...	31.1 per cent.	...	55.3 per cent.
<i>A. hyrcanus</i>	...	...	...	11.3 „	...	10.3 „
<i>A. aconitus</i>	...	...	...	53.0 „	...	30.8 „
<i>A. fuliginosus</i>	...	...	...	4.2 „	...	1.7 „
<i>A. subpictus</i> var. <i>malayensis</i>			...	0.003 „	...	0.01 „
SHADE BREEDERS.—						
<i>A. leucosphyrus</i>	...	...	...	0.003 per cent.	...	—
<i>A. tessellatus</i>	...	...	...	0.2 „	...	0.2 per cent.
SMALL POOL BREEDERS.—						
<i>A. vagus</i>	...	...	...	0.1 per cent.	...	0.2 per cent.
<i>A. kochi</i>	...	...	...	0.1 „	...	1.4 „

The table shows that the large pool or swamp breeders maintain their predominance throughout the year, but the interesting feature is that *A. aconitus* has dropped from 53 per cent. to 30.8 per cent. and that its place as predominant species has been taken by *A. barbirostris*. The difference between the species found in the relatively clean water swamp and the polluted fish-pond, which was pointed out by Dr. Lamborn, continues to be maintained since the proportion of *A. aconitus* found this year in the fish-pond (see Table III in the Appendix) is only 0.04 per cent.

The decrease of *A. aconitus* and the increase of *A. barbirostris* shows that the fauna of this swamp is tending to resemble that of the Brickfields Road Swamp (see M.B. Reports Vol. II, p. 5) in which the percentage of *A. aconitus* was only 0.9, and in which only 56 specimens of *A. aconitus* were obtained as against 2,025 specimens of *A. barbirostris*. The Brickfields Road Swamp is on the banks of the Klang River



below Kuala Lumpur and is certainly more polluted than the Campbell Road Swamp which is situated on the banks of the same river above the town. It is difficult to avoid the conclusion that the change in fauna in the Campbell Road Swamp is due to progressive pollution of that swamp causing it to commence to resemble the Brickfields Road Swamp. This is another link in the chain of evidence associating *A. aconitus* with clean unpolluted water.

The adults caught on the banks of the swamp show a very remarkable increase in *A. vagus* both numerically and proportionately as follows:

In 1921, out of 5,039 specimens, 138 or 2.7 per cent. were *A. vagus*.

In 1922     ,,     2,098     ,,     600     ,, 28.6     ,,     ,, *A. vagus*.

This increase in adults is probably due to an invasion of the area by those bred out from the larvae in the small pools on the filling done in the neighbourhood, because no very great increase in *A. vagus* larvae had occurred in the swamp, as is shown by the larva table above. Adults of *A. aconitus* on the other hand showed a decrease both numerically and proportionately, thus:

In 1921, out of 5,039 specimens, 4,482 or 88.9 per cent. were *A. aconitus*.

In 1922     ,,     2,098     ,,     1,360     ,, 64.8     ,,     ,, *A. aconitus*.

This decrease in *A. aconitus* adults is probably due to the relative decrease in the larvae of this species which has been seen to have occurred in the swamp, and also to the general reduction in mosquito breeding brought about by the oiling done under the direction of the Health Department.

Work has been stopped in this area because the oiling of the swamp has rendered the place unsuitable for further observation, but similar work has been started in three other places where *A. maculatus* is the predominant species. It is hoped that these observations may result in detecting any seasonal variation that there may be in the frequency of this important species, and also in getting some light on the associated problem of whether there might be any seasonal relationship between the allied forms *A. maculatus* and *A. karwari*.

#### PULAU JEREJAK.

This island was visited in order to study the breeding places of anophelines in relation to the sites chosen for extending the Leper Hospital.

The feature of main interest in the observations made is that the height above sea-level at which seepage occurred was seen to follow very closely the general configuration of the land and to be roughly proportional to the height of the hills, and that the breeding places of *A. maculatus* depended on this distribution of seepage areas.

The hills behind the Leper Hospital are the highest in the island and the hills behind the new sites are much lower, there being a difference in height of about 300 feet. Around the present Leper Hospital the seepage was relatively high, and here many breeding places were found; but passing towards the new sites the height of the seepage gradually fell, and fewer breeding places were found, till on the new sites themselves the seepage occurred at or below sea-level and no breeding places were found. These observations, however, were made in extremely dry weather and in wet weather the general height of seepage would rise and cause breeding places for *A. maculatus* on the new sites. In the report on the subject it was suggested that the new sites would always be drier than the old, and that therefore the breeding places would always be fewer and easier to control than the breeding places on the old sites.

#### CANTONESE CEMETERY, KUALA LUMPUR.

In preparation for the experimental drainage of a ravine in this cemetery a detailed survey of anopheline breeding places was carried out. Certain breeding places were marked out for periodical observation during the progress of drainage in order to note any alteration in mosquito fauna that occurred. Unfortunately the site proved unsuitable for the experiment and the work was abandoned, but the results of the preliminary survey were forwarded as a report on the distribution of anophelines in a ravine. The main feature of this report is that the small pool breeders predominate at the head of the ravine and the swamp breeders predominate lower down.

#### CAMERON'S HIGHLANDS EXPEDITION.

This expedition was organised by Mr. H. C. Robinson in August. *A. maculatus* was found all along the way as far as the road existed, but, as usual, this species did not extend into the jungle. *A. aitkeni* and *A. leucosphyrus*, however, were found along the whole route, and as these are the species which have been shown to be typical of jungle covered ravines, and to be replaced by *A. maculatus* when their breeding places are exposed to the light, it may be expected that *A. maculatus* will enter if the district is opened up.

But in the report on this subject it is suggested that although *A. maculatus* will probably enter it may not cause malaria. The reason for this suggestion is that this species has been found at 6,000 feet in places where malaria is unknown, probably owing to the absence of some climatic factor essential for the production of malaria.

Another point of interest in this work was the addition of two new species to the type collection, namely, *A. lindesayi* and *A. wellingtonianus*.

#### TYPE COLLECTION.

*A. lindesayi*, a species new to this country was found on the expedition to Cameron's Highlands. The identification of this species was kindly confirmed by Mr. F. W. Edwards of the British Museum. The main interest of its discovery in this country is that it connects the fauna of our main range with that of the Himalayas.

On the same expedition a good series of specimens of *A. wellingtonianus* was secured and added to the collection, which hitherto contained no specimen of this type. The species was previously known only from a single adult obtained from Taiping Hill, consequently this is the first time the larva has been found and studied. Specimens of male and female of this species have been sent to the British Museum.

An interesting fact is that the larvae of these two species (*A. lindesayi* and *A. wellingtonianus*) are so similar that they cannot be definitely distinguished. Thus they form a further pair of species hatching from similar larvae, and add to the material for studying the possible relationships that may exist between allied forms. This subject was broached in last year's report in connection with the possible variation of *A. leucosphyrus* when that species breeds in unusual places. Further data on the subject have been obtained based on leucosphyrus-like larvae found in fallen bamboos. Another isolated observation on this subject was the discovery that *A. leucosphyrus* larvae found in a disused tin hatched out to be the variety *hackeri* of that species.

It is hoped to take up the study of this subject in detail during the coming year with particular reference to the maculatus-karwari problem.

Type collections illustrating the commoner species of anophelines have been sent to:

- Dr. P. T. O'Farrel, Bahau.
- Dr. W. O. Pou, Kuala Lipis.
- Dr. R. B. Jackson, Seremban.
- Mr. David G. Stead, Singapore.
- Dr. A. K. Cosgrave, Kuala Lumpur.
- Dr. W. S. Leicester, Kuantan.
- Dr. W. J. Moir, Klang.
- Dr. J. T. Clarke, Kulim.

Living material has been supplied to Miss Jepps for infection experiments and to Dr. Stanton for observations on the mouth parts.

Special material has been sent to:

- Mr. F. W. Edwards, London, and
- Prof. T. Watabiki, Tokyo.

#### MALAYA-BORNEO EXHIBITION.

A series of living and mounted specimens of mosquitos were taken to Singapore for demonstration at the Malaria Advisory Board's stall at this Exhibition.

After the Exhibition it was decided to keep the contents of this stall together and to house it at the Bureau. Accordingly, alterations and extensions were made to the existing museum and the exhibit forms an excellent nucleus of a museum for demonstrating the causes, effects, prevention and treatment of malaria, and the results of anti-malarial measures.

The arrangement of the museum has been almost entirely in the hands of Capt. Hoffin. It has already attracted visitors of all classes and nationalities. The material, being always ready for exhibition, has also resulted in a considerable saving of time in preparing demonstrations for visitors, but there are several gaps and much more material is required. Mr. H. M. Pendlebury has kindly started a collection of natural enemies of the mosquito for this museum, and other material, especially pathological material with detailed notes on the specimens, would be acceptable.



## CHARACEAE.

A. Caballero has written several papers\* claiming larvicidal properties for three species of *Chara*, namely, *Ch. foetida*, *Ch. contraria* and *Ch. hispida*.

Two species of *Characeae* were collected and studied but no very satisfactory results were obtained. Anophelines were found in the ponds from which the plant was collected, and the plant did not prevent culicines from breeding in the tanks in which it was kept in the laboratory. Larvae of anophelines and culicines lived well in dishes containing the alga, they fed on the microscopic organisms living on its branches, and pupated normally. Moreover the film which formed on the water, which Caballero describes as having larvicidal properties, served as an attractive food material for the larvae, consisting as it did of a mass of micro-organisms, mainly bacteria and infusoria.

Later, however, a third species was obtained which certainly seems to act as a deterrent to mosquito breeding. Specimens of each of these species have been sent therefore to Dr. E. J. Butler, C.I.E., for identification to make certain whether the right species have been obtained. When his reply is received this subject will be studied further.

## FISH.

An enquiry was received from the Agricultural Department as to whether certain small fish in one of the tanks in the Gardens were "Millions" or not. These fish were collected and were identified by Mr. E. Seimund as young *Temperas* (*Cyclocheilichthys apogon*).

An interesting observation was made on these fish which illustrates a fallacy in laboratory experiments on the larvicidal properties of fish. The fish ate up larvae with avidity in a glass jar and it was decided to put them into a tank containing *Characeae* in which there also were hundreds of culicine larvae, in order to destroy the larvae and to allow the tanks containing the *Characeae* to be used without becoming a nuisance. The fish however ignored the larvae and fed greedily on the film of micro-organisms in the tank, and moreover, when taken out and placed again in a glass jar, it was found that so gorged were they with their favourite food that they ignored larvae placed in the jar. The next day however they ate up larvae as before.

But interest has been revived in fish, by the presentation of a large number of Ikan borlaga (*Betta pugnax*) to the laboratory by Mr. Yeoh Seng Niah. This fish has been shown to have an avid appetite for larvae even in tanks containing plenty of alternative food material. The fish are breeding well in the tanks and it is intended to start field experiments with them in the coming year.

## WORK ON OILING.

This work has been continued with special reference to the action of Solar Oil. A memorandum on the subject to the effect that Solar Oil is an efficient larvicide was issued, and this has been circulated to all Health Officers and Chairmen of Mosquito Destruction Boards.

## MICROPHOTOGRAPHY.

Owing to better facilities for obtaining the electric current necessary for working the microphotographic apparatus, the whole outfit was transferred here from the Institute for Medical Research. The apparatus is working satisfactorily and it will be useful in establishing permanent records of experiments in which it is impossible to make permanent preparations of specimens.

It has already been of use in demonstrating minor points of difference in the two species of anophelines, especially studied this year, namely, *A. lindesayi* and *A. wellingtonianus*. It has also been used extensively by Capt. Hoflin in preparing lantern slides to illustrate his lecture on malaria.

## PUBLICATIONS AND REPORTS ISSUED FROM THE BUREAU.

Dr. Lamborn published in the *Bulletin for Entomological Research* the two following papers based on his work here:

"Some Problems of the Breeding places of the Anophelines of Malaya: A Contribution towards their Solution". May, 1922, Vol. XIII, pp. 1-23.

"The Bionomics of some Malayan Anophelines". August, 1922, Vol. XIII, pp. 129-149.

Copies of these papers are being obtained for distribution.

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\* Abstracted in Review of Applied Entomology, Series B, Vol. VIII, p. 61, Vol. X, pp. 108, 136 and 221.

The following is a list of reports issued during the year. Copies may be seen at the Bureau or will be sent on loan :

- “On the Distribution of Anophelines in a Ravine”. January 23rd.
  - “On the Distribution of Anophelines on Pulau Jerejak, with special reference to the sites chosen for the extension of the Leper Hospital”. February 2nd.
  - “Annual Report, 1921”. February 11th.
  - “Report on Anophelines caught in Kuala Lumpur”. February 21st.
  - “Memorandum on the use of Solar Oil”. August 14th.
  - “Expedition to Cameron’s Highlands. Distribution of Anophelines and the Malaria Problem”. October 17th.
- Nineteen reports on Specimens sent for Identification.

#### STAFF AND EXPENDITURE.

The staff was reduced by transferring two laboratory assistants to other Government departments. Mr. G. de Netto joined the Mosquito Destruction Board, Kuala Lumpur, on May 12th, and Inche Mohamed Zairuman joined the Singapore Health Service on June 1st. In addition two collectors left the service and their posts were not filled.

This reduction of staff and the curtailment of travelling to a minimum have resulted in a considerable saving.

22nd February, 1923.

H. P. HACKER,  
Malaria Research Officer.



## APPENDIX.

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### TABLE I.

Adult anophelines caught at the Malaria Advisory Board's cooly lines.

The yellow curve in the Chart is based on these figures.

### TABLE II.

Adult anophelines caught at No. 562, Petaling Hill.

The red curve in the Chart is based on these figures.

### TABLE III.

Anopheline larvae caught in the Fish-ponds at Pudu.

The green curve in the Chart is based on these figures.

### TABLE IV.

Monthly rainfall at the Gaol and the Weld Hill Reservoir.

The black curve in the Chart is based on these figures.

TABLE I.

Adult anophelines caught at the Malaria Advisory Board cooly lines, Loke Yew Road.  
The yellow curve in the Chart is based on these figures.

Month of Year 1922.	Total number caught on which the percentage is calculated.	Percentage monthly catch for each species.											
		Large pool or open swamp breeders.					Shade breeders.			Small pool breeders.			
		<i>A. barbirostris.</i>	<i>A. hyrcanus.</i>	<i>A. aconitus.</i>	<i>A. fuliginosus.</i>	<i>A. subpictus</i> var. <i>malayensis.</i>	<i>A. leucosphyrus.</i>	<i>A. umbrosus.</i>	<i>A. tessellatus.</i>	<i>A. vagus.</i>	<i>A. kochi.</i>	<i>A. maculatus.</i>	<i>A. karuvari.</i>
January ...	416	...	...	1.0	...	0.2	...	...	...	98.8			
February...	363	0.3	0.3	0.3	...	...	...	...	...	99.2			
March ...	334	...	0.9	1.5	...	...	...	...	0.6	96.7	0.3		
April ...	412	...	0.2	1.9	...	...	...	...	0.5	94.9	2.4		
May ...	260	...	...	0.4	...	...	...	...	...	99.6			
June ...	387	...	0.3	...	...	...	...	...	...	99.2	0.5		
July ...	376	...	...	0.3	...	...	...	...	...	99.7			
August ...	518	...	...	...	...	...	...	...	...	100.0			
September	1,018	...	...	...	...	...	...	...	...	99.9	0.1		
October ...	690	...	...	0.1	...	...	...	...	...	99.9			
November	677	0.1	0.1	0.4	...	...	...	...	...	98.5	0.6	...	0.1
December	327	0.3	0.9	1.5	...	...	...	...	0.3	96.0	0.9		
Total Specimens in 1922 ...	5,778	3	10	29	...	1	...	...	5	5,708	21	...	1
Percentage for the year 1922 ...	...	0.05	0.2	0.5	...	0.02	...	...	0.09	98.8	0.4	...	0.02
		0.77					0.09			99.22			

For comparison :—

Total Specimens in 1921 ...	8,123	15	65	259	3	36	1	2	27	7,677	29	6	3
Percentage for 1921 ...	...	0.2	0.7	3.2	0.04	0.4	0.01	0.02	0.3	94.5	0.4	0.07	0.04
		4.54					0.33			95.01			

## REMARKS.

- (1) The presence of swamp breeders at the beginning and end of the year has been shown on the Chart to coincide with wet periods of the year, while their complete absence in August and September corresponds with the end of the dry period of the year.
- (2) The small pool breeders rise from 95.01 per cent. in 1921 to 99.22 per cent. in 1922. This has been attributed to the effect of drainage and cultivation in the neighbourhood.



TABLE II.

Adult anophelines caught at No. 562, Petaling Hill.  
The red curve in the Chart is based on these figures.

Month of year 1922.	Total number caught on which the percentage is calculated.	Percentage monthly catch for each species.											
		Large pool or open swamp breeders.					Shade breeders.			Small pool breeders.			
		<i>A. barbirostris.</i>	<i>A. hyrcanus.</i>	<i>A. aconitus.</i>	<i>A. fuliginosus.</i>	<i>A. subpictus</i> var. <i>malayensis.</i>	<i>A. leucosphyrus.</i>	<i>A. umbrosus.</i>	<i>A. tessellatus.</i>	<i>A. vagus.</i>	<i>A. kochi.</i>	<i>A. maculatus.</i>	<i>A. karwari.</i>
January ...	144	3.5	2.8	40.3	13.9	...	...	3.5	...	32.6	1.4	...	2.1
February...	309	3.2	1.0	27.5	21.7	...	...	3.6	...	41.7	1.0	...	0.3
March ...	178	5.1	1.7	27.5	11.8	...	...	1.7	1.1	50.0	1.1	...	...
April ...	131	3.8	1.5	45.8	6.1	...	...	3.1	...	38.2	1.5	...	...
May ...	71	4.2	1.4	31.0	15.5	...	...	14.1	...	32.4	1.4	...	...
June ...	108	2.8	1.9	20.4	6.5	...	...	...	...	68.5	...	...	...
July ...	144	0.7	1.4	11.8	8.3	...	...	...	...	76.4	0.7	...	0.7
August ...	169	0.6	...	13.0	1.2	...	...	0.6	...	84.6	...	...	...
September	383	0.5	0.3	9.1	0.5	...	...	...	0.3	89.3	...	...	...
October ...	336	0.9	0.3	8.6	5.7	...	...	0.3	1.2	79.8	3.3	...	...
November	193	0.5	2.1	25.4	5.7	...	...	4.7	1.0	59.6	1.0	...	...
December	154	2.6	5.8	31.2	6.5	...	...	4.5	1.3	44.2	2.6	...	1.3
Total Specimens in 1922 ...	2,320	47	32	496	190	...	...	51	11	1,458	28	...	7
Percentage for the year 1922 ...	...	2.03	1.4	21.4	8.2	...	...	2.2	0.5	62.8	1.2	...	0.3
		33.03					2.7			64.3			

For comparison :—

Total Specimens in 1921 ...	3,285	103	77	1,281	695	3	3	184	20	854	52	5	8
Percentage for 1921 ...	...	3.1	2.3	39.0	21.2	0.1	0.1	5.6	0.6	26.0	1.6	0.2	0.2
		65.7					6.3			28.0			

REMARKS.

- (1) In the early part of the year the small pool breeders rise to a maximum in March and then diminish. This maximum forms peak III on the Chart and coincides with a period of high rainfall.
- (2) In the latter part of the year the small pool breeders again increase to a maximum, 89.3 per cent., in September. This increase occurs during the period of low rainfall and the decrease which occurs at the end of the year coincides with the onset of wet weather.
- (3) The general increase in small pool breeders indicated by the gradual rise in the curve on the Chart is shown in the table by the increase from 23 per cent. in 1921 to 64.3 per cent. in 1922. This has been attributed to the general reduction in swamps.

TABLE III.

Anopheline larvae caught in the Fish-ponds at Pudu.  
The green curve in the Chart is based on these figures.

Month of Year 1922.	Total number caught on which the percentage is calculated.	Percentage monthly catch for each species.												
		Large pool or open swamp breeders.					Shade breeders.			Small pool breeders.				
		<i>A. barbirostris.</i>	<i>A. hyrcanus.</i>	<i>A. aconitus.</i>	<i>A. fuliginosus.</i>	<i>A. subpictus</i> var. <i>malayensis.</i>	<i>A. leucosphyrus.</i>	<i>A. umbrosus.</i>	<i>A. tessellatus.</i>	<i>A. vagus.</i>	<i>A. kochi.</i>	<i>A. maculatus.</i>	<i>A. karwari.</i>	
January ...	1,414	11.7	15.3	0.1	1.3	0.5	...	...	...	71.1	0.1			
February ...	1,993	41.5	28.7	...	2.2	...	...	...	...	27.6				
March ...	3,283	33.8	48.3	0.1	1.3	0.3	...	...	...	16.2				
April ...	2,576	21.9	31.3	...	0.2	0.2	...	...	...	46.4				
May ...	1,950	42.2	31.4	0.1	0.5	0.6	...	...	...	25.1				
June ...	3,136	3.6	0.2	...	...	...	...	...	...	96.2				
July ...	4,384	3.7	1.8	...	0.1	...	...	...	...	94.3	0.1			
August ...	2,258	6.5	0.4	...	...	0.2	...	...	...	92.9				
September ...	2,639	2.8	0.5	0.03	0.1	0.07	...	...	...	96.4				
October ...	2,835	15.1	9.1	0.2	1.2	0.1	...	...	...	74.3	0.1			
November ...	2,521	16.1	1.7	...	1.4	12.5	...	...	...	68.3				
December ...	1,471	49.1	10.3	...	1.5	32.5	...	...	0.1	6.5				
Total Specimens in 1922 ...	30,460	5,541	4,354	11	217	837	...	...	1	19,492	7			
Percentage for the year 1922 ...	...	18.2	14.3	0.04	0.7	2.7	...	...	0.003	63.9	0.02			
		35.94					0.003			63.92				

For comparison :—

Total Specimens in 1921 ...	27,856	2,648	12,629	5	219	41	...	...	...	12,268	46		
Percentage for 1921 ...	...	9.5	45.3	0.02	0.8	0.1	...	...	...	44.0	0.2		
		55.72					0			44.2			

REMARKS.

- (1) The small pool breeders show three maxima, viz.:—in January, in April, and in the period from June to September.
- (2) From the Chart it is seen that the maximum in January is not a peak on the curve but a point on the fall from peak II, which occurred at the end of the previous year. The rapid fall from 99.78 per cent. in October, 1921, to 16.2 per cent. in March, 1922, has been attributed to the onset of rain at the end of 1921.
- (3) The maximum reached in April is shown as peak III in the Chart. The relation of this peak to wet weather and to peak III on the Petaling Hill curve is discussed in the text.
- (4) The maximum extending from June to September forms peak IV on the Chart. It coincides with the dry period of the year and the rapid fall to a minimum towards the end of the year coincides with the onset of rain in October.



TABLE IV.

Monthly rainfall at the Gaol and the Weld Hill Reservoir.  
The black curve in the Chart is based on these figures.

Month.							Rainfall in inches.		Average rain- fall used for curve.
							Gaol.	Weld Hill Reservoir.	
1921.									
January	...	...	...	...	...	...	9.57	7.66	8.62
February	...	...	...	...	...	...	2.32	3.04	2.68
March	...	...	...	...	...	...	13.05	9.66	11.36
April	...	...	...	...	...	...	7.51	8.26	7.89
May ...	...	...	...	...	...	...	5.86	5.53	5.7
June...	...	...	...	...	...	...	5.69	3.52	4.61
July ...	...	...	...	...	...	...	6.85	6.39	6.62
August	...	...	...	...	...	...	6.28	6.98	6.63
September	...	...	...	...	...	...	9.35	8.23	8.79
October	...	...	...	...	...	...	9.85	7.4	8.63
November	...	...	...	...	...	...	11.09	3.7	9.9
December	...	...	...	...	...	...	12.72	11.71	12.22
1922.									
January	...	...	...	...	...	...	10.37	10.85	10.61
February	...	...	...	...	...	...	10.25	9.25	9.75
March	...	...	...	...	...	...	13.37	13.23	13.3
April	...	...	...	...	...	...	7.51	7.43	7.47
May ...	...	...	...	...	...	...	6.11	7.1	6.61
June...	...	...	...	...	...	...	5.35	5.21	5.28
July ...	...	...	...	...	...	...	3.97	3.28	3.63
August	...	...	...	...	...	...	6.31	5.51	5.91
September	...	...	...	...	...	...	4.65	4.99	4.82
October	...	...	...	...	...	...	15.28	11.25	13.27
November	...	...	...	...	...	...	11.12	9.91	10.52
December	...	...	...	...	...	...	12.84	9.93	11.39

REMARKS.

In general the beginning and end of the years have been wet and the middle part dry.  
This distinction into wet and dry periods is more marked in 1922 and the relationships traced between the curves on the Chart show up more definitely in 1922 than in 1921.

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FEDERATED MALAY STATES, FOR THE YEAR 1922.

MALARIA AND QUININE.

Investigations on the treatment of malaria by quinine and other alkaloids of cinchona have been continued by Dr. William Fletcher, Bacteriologist, with the assistance of several colleagues. The details of these investigations have, at the request of Government, been submitted to the "Cinchona Derivatives and Malaria Committee of the Medical Research Council". The Medical Research Council is undertaking an investigation into the action of the various cinchona alkaloids in the treatment of malaria and for this purpose will supply specially purified and tested preparations to workers in different parts of the British tropics. We have to some extent anticipated the proposals of the Medical Research Council in this respect and now present a summary of the results of our inquiries.

In Malaya malaria research has been almost entirely devoted to a study of the species of anopheline mosquitoes, their relative importance as malaria carriers, their larvae and their breeding places. These fascinating studies and the remedial measures based upon them have tended to produce in the minds of the medical profession and of the general public an impression that only by measures directed against mosquito breeding may any mitigation of the malaria scourge be achieved; the human sufferer from malaria has been in a measure neglected or ignored. One of the objects then of the inquiries here reviewed is to direct renewed attention to the human disease, malaria, and to the possibility of devising improved methods of treatment.

(a) *Cinchona Febrifuge*.—The results obtained with this preparation in the treatment of malaria were reported in part in 1921. Forty-two cases have now been treated with cinchona febrifuge and the sample employed (Bandoengsche Kininefabriek, Java) proved as efficient as quinine sulphate, and not more toxic, when given in doses of ten grains twice daily. In the treatment of quartan infections it was found that gametocytes are more resistant than trophozoites and that, contrary to current opinion, quartan malaria is not so prone to relapse within three weeks after treatment as benign tertian malaria.

(b) *Alkaloids of Cinchona other than Quinine*.—The principal alkaloids contained in cinchona bark are quinine, quinidine, cinchonine and cinchonidine, which are crystallisable, and quinoidine which is not. Quinoidine is the name given to the mixture of uncrystallisable alkaloids and impurities which remain after the crystallisable alkaloids have been removed from the bark extract.

It was found that in doses of ten grains twice daily the four crystallisable alkaloids quinine, quinidine, cinchonine and cinchonidine appeared to be of about equal value in causing the disappearance of malaria parasites. None of these alkaloids produced toxic symptoms in this dosage. In smaller doses of five grains twice daily, cinchonine appeared to be less effective than the sulphate of quinine and quinidine. Cinchonine was definitely inferior to the other crystallisable alkaloids. In the treatment of quartan malaria quinidine sulphate gave slightly better results than quinine sulphate. Quinoidine in doses of five grains twice daily was ineffective and in doses of ten grains twice daily proved to be too toxic for employment in the treatment of malaria.

(c) *Tasteless Preparations of Quinine*.—These preparations are useful for administration to children and others who can neither tolerate the bitterness of the soluble salts nor swallow pills. They are tasteless by virtue of their insolubility in water, yet we have seen one of them, euquinine, which is a most expensive preparation, dissolved by the aid of acids and dispensed as a bitter mixture. Indeed this method is recommended in at least one recent text book. Of these preparations quinine tannate, quinine dicarbonate and quinine ethyl carbonate (euquinine) were tested. Euquinine proved effective. The samples of quinine tannate and quinine carbonate used in the experiments were valueless.

(d) *Intramuscular Injections of Quinine*.—With Mr. S. Visuvalingam who was temporarily attached to the staff of the Institute, Dr. Fletcher conducted an inquiry into the method of quinine administration by intramuscular injection.

They remark that no one with experience in the treatment of malaria is likely to deny the value of intramuscular injections of quinine in those grave emergencies where for one reason or another it is impossible to administer the drug by the mouth. Many people have been cured by injections who otherwise would have died. While this is so, it is equally certain that quinine is often given by the intramuscular method when it could have been given by the mouth with equal benefit and without the risk of the patient which is always incurred when injections are employed.



We have seen a healthy child crippled for life from paralysis of a sciatic nerve injured by an injection of quinine. We have seen a mechanic bed-ridden for several months with abscesses and discharging sinuses in his buttocks from quinine injections. We have seen a man, who a year earlier was earning good wages as a motor-car driver, reduced to poverty on account of permanent ankylosis of the left knee and ankle, the result of an injection of quinine.

We had supposed such cases to be very rare but in the course of this investigation it was learned that they were not so uncommon as we had hoped. Thus Dr. E. A. O. Travers, Medical Officer, General Hospital, Kuala Lumpur, informed us that, though only a small proportion of injections were followed by suppuration, this method of administering the drug was so common outside the hospital that he frequently admitted patients suffering from abscesses as the result of quinine injections. He had seen no fewer than twenty such cases in less than five months. There were five cases in his hospital at the time of our visit to it.

The majority of medical men do not realise that quinine solutions of the strength employed for intramuscular injections always cause immediate necrosis of the muscle fibres at the site of inoculation. In most cases the dead muscle fibres are absorbed within three weeks and no harm results. But though the dead tissue is not visible, it is a source of danger. If a few micro-organisms gain access, either from without or from the blood stream, they encounter no resistance in the necrosed muscle, which forms an excellent nidus for their multiplication, and suppuration results.

Serious illness and mutilation may occur as the result of intramuscular injections of quinine and in some cases where this has happened the drug could equally well have been given by the mouth. Quinine injected into muscles is not absorbed so quickly nor at so constant a rate as quinine given by the mouth. Judged by the excretion of quinine in the urine and by the presence or absence of malaria parasites in the blood, intramuscular quinine does not maintain an effective concentration of quinine in the body for a longer period than oral quinine. The view that quinine injected into a muscle forms a reservoir which keeps up the supply of quinine in the peripheral blood has no basis in fact.

Quinine injections should be reserved for patients who are dangerously ill with malaria, for those who are comatose, and for those who vomit the quinine they have swallowed. Few people are honest about taking quinine and daily examination of the urine is the best means for detecting shirkers; the urine should be examined daily in every case of malaria under treatment. When a medical man prescribes an intramuscular injection of quinine he should give it himself. This would tend to limit this form of treatment to urgent cases and it is right that the prescriber should assume full responsibility for any ill effects that may follow.

(e) *Rectal Injections of Quinine*.—Most medical men in the tropics have occasionally prescribed quinine in the form of an enema, but few of them can have witnessed the results or this method of quinine administration would long since have been condemned. Our experiments showed that rectal injections of quinine are irritating and that the passing of blood and mucous is the usual sequel. The injections are quickly returned and are of little therapeutic value.

(f) *Quinine Idiosyncrasy*.—Dr. Fletcher and Dr. Travers had under observation a case of quinine idiosyncrasy. Though this condition is much less common than might be gathered from the text books, it is an important one. The physician who is called upon to treat an attack of malaria in a patient who is hypersensitive to quinine finds himself in the difficult position of having to choose between poisoning his patient with the drug and allowing the disease to run its course unchecked. In the case under review the difficulty was overcome by substituting for quinine, cinchonine base in doses of four grains four times daily. With this treatment the patient steadily improved and the symptoms which were ascribed to quinine, namely, gastric irritation, facial oedema, and dermatitis, disappeared completely.

#### MALARIA AND ANOPHELES.

Miss M. W. Jepps, Protozoologist, carried out a series of experiments with the object of determining the susceptibility to malaria infection of several species of *Anopheles*. Of 38 specimens of *Anopheles vagus*, Donitz, which were fed on cases of subtertian malaria, 10 were found to be infected; in several of these mature zygotes were observed. This species has been thought to be relatively unimportant in malaria transmission but these experiments suggest that on occasion it may prove to be quite otherwise. Dogmatic assertions about the relative importance of anopheline species in the spread of malaria should be received with caution, they are a frail foundation for policy in malaria control. At most the mosquito is only one factor in a complex of conditions which results in severe or epidemic malaria.



Dr. Andrew Balfour, Director-in-Chief of the Wellcome Bureau of Scientific Research, has directed our attention to some factors in the epidemiology of disease that have been little studied by the present generation. He points out that plague tends to recur in epidemic form in widely separated parts of the world and in a manner for which our present knowledge of the spread of disease affords no adequate explanation. He recalls the studies of Meldrum in Mauritius on the relations of weather to mortality and on the climatic effects of forests. It may well be that these and kindred questions will repay investigation in relation to the epidemiology of malaria in Malaya.

#### BERI-BERI.

The Fourth Congress of the Far Eastern Association of Tropical Medicine passed the following resolution on the subject of beri-beri:

“Whereas there is enormous annual loss of human life, with corresponding invalidism and disability, due to deficient diet, in the countries of the Far East; and whereas the deficiency is mainly due to the over-milling of rice which removes a vital part of the essential food factors; and whereas nothing has been put forward in the past ten years which disproves the claim that beri-beri can be controlled by substituting undermilled for polished rice in countries in which rice is the staple article of diet; and whereas it has been demonstrated by Fraser and Stanton and others that a satisfactory standard of milling is the presence of a minimum of 0.4 per cent. of  $P^2 O^5$  (phosphorus pentoxide) in rice:

“Therefore be it resolved that this Fourth Congress of the F.E.A.T.M. considers it urgently desirable that the Governments concerned should take action to discourage the use of rice which is below this standard; and that, with a view to taking united action, the F.E.A.T.M. recommends the appointment of a Commission to which each country is asked to send a delegate, which shall make recommendations as to the best methods of bringing beri-beri under control.

“To assist in the attainment of the above object it is proposed that the Congress requests each Vice-President to present these proposals to his Government and that the general Secretary-treasurer sends official copies of these resolutions to the countries concerned. If favourable action is taken, the Governments are asked to communicate with one another as to the place in which such Commission should sit.”

Consequent upon the submission of this resolution to Government it was decided to refer the question to the Health Committee of the League of Nations for consideration as to the desirability of appointing an International Commission to advise on the best means of bringing the disease beri-beri under control.

During the year under review over fifty litres of Vitamin B. Extract have been prepared from rice meal and issued to hospitals and practitioners for use in the treatment of beri-beri.

Through the courtesy of the Secretary for Agriculture and the Economic Botanist we have received a number of samples of rice prepared in small mills from padi of local origin. On examination most of these samples have proved to be lightly milled and free from the danger of causing beri-beri.

#### MELIOIDOSIS.

In previous reports from this laboratory it has been forecasted that melioidosis would prove to be a natural infection of rodents and only occasionally transmitted to man through the medium of food-stuffs contaminated by the excreta of these animals. It had already been learned that rats of certain species could readily be infected by feeding them on cultures of the causative organism *B. whitmori*, but proof of our hypothesis had been lacking owing to failure to identify the natural disease in rodents. This proof has now been obtained.

In March, 1922, a wild rat (*M. griseiventer*, Bonhote) which had been found dead in the house of a European official, was brought for examination by the Health Officer, Dr. F. V. Jacques.

On opening the thorax its contents were found to be a hard, solid mass, like cartilage but very friable. This mass consisted of the lungs and heart, adherent to one another and to the walls of the thorax. The stomach, intestines and bladder were empty. There were four small embryos in the left corner of the uterus.

A very few bipolar staining organisms were found in films prepared from the lungs. *B. whitmori* was cultivated from the spleen and from the lungs; it possessed the ordinary cultural characters of the organism and was agglutinated to full titre, one in six thousand, by a serum prepared with a known culture (Ragaviah).

A rabbit inoculated in the right nostril with a culture from the rat's lung, died on the eighth day with nasal discharge, obstructed breathing, haemorrhagic tracheitis and the typical signs of melioidosis. *B. whitmori* was cultivated from this animal's heart, spleen, trachea, lung and gall bladder.



A second rat of the same species was given a feed of padi contaminated with a culture from the lung of the first rat. It died on the thirty-sixth day from melioidosis and its lungs were found to be in the same condition as those of the rat from which the culture had been obtained. In addition there were small cheesy nodules in the spleen and a portion of the small intestine was congested and contained mucus. *B. whitmori* was cultivated from the lungs, heart blood and spleen, but not from the intestine.

Two monkeys (*Macacus cynomologus*) which were fed on similar culture from the lungs of the wild rat, remained uninfected.

Though three rats, which were kept in cages in the animal-house, became infected some years ago during an epizootic amongst the laboratory animals, this is the first recorded case of melioidosis in a wild rat infected under natural conditions.

The similarity of melioidosis to glanders is so striking that Whitmore published his account of it under the title of "A glanders like disease". It was not until he discovered that the lesions were associated with the presence of a strange organism and that *B. mallei* could not be isolated from them that he concluded that he was dealing with a new disease.

During this year comparative studies have been undertaken of three cultures of *B. mallei*, Loeffler, and three cultures of *B. whitmori*, Stanton and Fletcher. The sources of these six cultures were as follows:

(1) *B. mallei* (Java): This strain was sent to us by the Director of the Geneeskundig Laboratorium of Weltevreden,, Java. It had been isolated from the lungs of a country-bred pony. (2) *B. mallei* (Muktesar): A culture of this organism, from the Imperial Bacteriological Laboratory at Muktesar in India, was received on September 20, 1922. Dr. J. V. Edwards, Imperial Bacteriologist, informed us that this strain was isolated from a country-bred pony and had been maintained for a long time in culture and by passage through guinea-pigs. (3) *B. mallei*, Minnett: This strain, from the National Collection of type cultures, was supplied by the Director of the Lister Institute. Its origin is not known to us.

(4) and (5) *B. whitmori* (Ragaviah) mucoid form and corrugated form respectively: Both these strains were isolated in June, 1921, from an abscess in the leg of a Telugu patient, Ragaviah, who had been suffering from melioidosis for eight months. The strains were a little more than a year old when the comparative tests were made. In the meantime they had been subcultured many times in the Laboratory and for several months they had been kept in sealed tubes of nutrient agar.

We have related elsewhere (Stanton and Fletcher 1921) that *B. whitmori* occurs in two forms; first the more common variety which grows as an opaque culture with a corrugated surface on glycerine agar and, secondly, a mucoid variety which forms a smooth, translucent yellowish film on the same medium. The mucoid variety of *B. whitmori* bears the same relationship to the ordinary corrugated form, as the mucoid variety of *B. paratyphosus* B. bears to the ordinary form of that organism (Fletcher 1920). Corrugated colonies can be grown from a mucoid culture, and we have proved the identity of the two types of agglutination and absorption tests. When peptone water was inoculated with the mucoid culture of the "Ragaviah" strain of *B. whitmori*, which we employed in these experiments, and plated out after ten days incubation at 37°C, about 10 per cent. of the colonies on the plate were of the corrugated type; the corrugated colonies having been thrown off by the mucoid form and being derived from it. (6) *B. whitmori* (rabbit): This was a culture of the mucoid type, obtained two years before from the spleen of a rabbit which had become infected in the animal-house attached to the laboratory. A corrugated strain was cultivated from the testes of the same animal.

The details of the investigations carried out with these organisms will be included in a monograph of melioidosis which it is proposed to publish as a Study from the Institute for Medical Research. Our conclusions are here summarized.

#### SUMMARY.

1. It is impossible to distinguish the lesions of melioidosis from those of glanders by means of inspection with the naked eye or even with the microscope.

2. The symptoms of the two diseases are similar. Melioidosis generally runs a more acute course.

3. The mallein test was applied in a case of chronic melioidosis and gave a positive reaction.

4. The blood of this chronic case agglutinated the three strains of *B. mallei*, which we examined. One of these strains absorbed the agglutinins for the homologous bacillus.



5. There are very few horses in the Federated Malay States. Melioidosis is primarily a disease of rodents.
6. Three cultures of *B. mallei*, namely, Java, Muktesar, and Minnett, were compared with three strains of *B. whitmori*, namely, Ragaviah corrugated, Ragaviah mucoid, and rabbit mucoid. *B. whitmori* occurs in two forms, a commoner corrugated form and a mucoid form which gives origin to the corrugated type.
7. *B. whitmori* differs from *B. mallei* in the following particulars: It is actively motile. It forms a corrugated growth on glycerine agar, a white opaque growth on ordinary agar, and a pellicle on broth. It grows more rapidly than *B. mallei* and it liquifies gelatine in a few days.
8. *B. whitmori* resembles *B. mallei* in the following particulars: The morphology of the organisms is similar. Young cultures of the mucoid form are indistinguishable from *B. mallei*. The growth on potato is similar. The action on milk and carbohydrates is the same. Both organisms produce Strauss's reaction in guinea-pigs.
9. *B. whitmori* absorbs the agglutinins from a *B. mallei*, Muktesar, serum: and *B. mallei*, Muktesar, absorbs the agglutinins from a *B. whitmori* serum.
10. *B. whitmori* and *B. mallei*, Muktesar, absorb the agglutinins from a *B. mallei*, Java, serum; but *B. mallei*, Java, does not absorb more than 75 per cent. of the agglutinins from *B. whitmori* and *B. mallei*, Muktesar, sera.
11. *B. mallei*, Minnett, possesses but little serological affinity with *B. whitmori* or with the other strains of *B. mallei*.

CONCLUSIONS.

1. *B. whitmori* is, serologically, identical with a strain of *B. mallei*, from Muktesar, but it differs from it by reason of motility, and the characters of its growth on laboratory media. A strain of *B. mallei*, obtained from Java, is closely related to these two organisms. A strain of *B. mallei*, from the National Collection of type cultures at the Lister Institute, is distantly related to the other three.
2. The causative organism of glanders is not always one and the same bacillus. A group of organisms differing from each other in serological properties, has been included under the name *B. mallei*. *B. whitmori* is a member of this group and melioidosis is a form of glanders which primarily affects rodents.

PROTOZOA IN DYSENTERY.

Miss M. W. Jepps, Protozoologist, continued her observations on human intestinal protozoa. Specimens were examined from 1,034 patients in the dysentery wards of the District Hospital, Kuala Lumpur, most of them indigent Chinese and Tamil labourers. She notes that one might be led to expect that the intestinal parasites of such patients would be abundant both in variety of species and incidence of infection but this has proved not to be true for the series of cases examined. Indeed the figures for some of the non-pathogenic protozoa are not so high as some which have been obtained for healthy subjects in England.

TABLE I.  
INTESTINAL PROTOZOA IN 1,034 CASES.

Organism.	No. of cases.	Per cent. of 1,034 cases.
<i>Entamoeba histolytica</i> ... ..	150	14.5
<i>Entamoeba coli</i> ... ..	80	7.7
? <i>Amoebae</i> ... ..	26	2.5
<i>Endolimax nana</i> ... ..	23	2.2
<i>Iodamoeba butschlii</i> ... ..	4	0.4
<i>Giardia intestinalis</i> ... ..	43	4.2
<i>Trichomonas hominis</i> ... ..	119	11.5
<i>Chilomastix mesnili</i> ... ..	26	2.5
<i>Enteromonas hominis</i> ... ..	36	3.5
<i>Embadomonas intestinalis</i> ... ..	1	0.1

In the report of the Uncinariasis Commission to the Orient, 1915-1917 (pp. 112-113), it is stated of the coolie population of Kuala Lumpur that "the Chinese as a race are more vigorous and resistant to disease than are the Tamils." As there pointed out, this is probably due to some extent to the better conditions under which the former live. In the present series of cases also, if Chinese and Indians are placed in separate groups, there is a marked and consistent difference in the extent of infection with both pathogenic and non-pathogenic intestinal protozoa. The degree of infection is higher among the Indians and this fact may be correlated with their poorer mode of life as compared with the Chinese.



TABLE II.  
INCIDENCE OF INTESTINAL PROTOZOA IN RELATION TO NATIONALITY.

Organism.	674 Indians (mostly Tamils).		356 Chinese.		4 Malays.
	No.	Per cent.	No.	Per cent.	
<i>Entamoeba histolytica</i> ... ..	128	19.1	20	5.6	1
<i>B. Coli</i> ... ..	74	11.0	6	1.7	...
? <i>Amoebae</i> ... ..	21	3.1	5	1.4	...
<i>Endolimax nana</i> ... ..	19	2.8	4	1.1	...
<i>Iodamoeba butschlii</i> ... ..	4	...	0	...	...
<i>Giardia intestinalis</i> ... ..	34	5.0	9	2.5	...
<i>Trichomonas hominis</i> ... ..	111	16.5	8	2.2	...
<i>Chilomastix mesnili</i> ... ..	24	3.6	2	...	...
<i>Enteromonas hominis</i> ... ..	33	4.9	3	...	...
<i>Embadomonas intestinalis</i> ... ..	0	...	1	...	...

Miss Jepps' detailed observations on the different species of protozoa will be published with Dr. Fletcher's observations on the bacteriology of dysentery.

CHARCOT-LEYDEN CRYSTALS IN DYSENTERY.

Considerable importance has been attached by some investigators during the past few years to the presence or absence of Charcot-Leyden crystals in the faeces. Thomson and Robertson (1921) "believe that their presence is due to specific action on the part of *Entamoeba histolytica*, that they are never found in dysenteries of bacillary origin . . . . . in the human stool they are diagnostic of dysentery caused by *Entamoeba histolytica*."

Miss Jepps made some observations on this point and concludes that in the past too positive statements have been made concerning the diagnostic value of Charcot-Leyden crystals in faeces. They may occur in dysentery stools of purely bacillary origin. There is however some evidence that they are one of the products resulting from intestinal infections, particularly with *E. histolytica* and the helminths.

NEW METHODS IN THE DIAGNOSIS OF SYPHILIS.

Mr. J. E. Lesslar, Assistant Pathologist, continued his studies of methods in the diagnosis of syphilis. The following table gives the results in 250 specimens of blood examined by the method of Kahn (a flocculation test) compared with the results in the same specimens examined by the Wassermann Test. Kahn's antigen was prepared at the Institute according to the direction laid down by the author.

Wassermann Test.						Kahn's Test.		
						Positive.	Negative.	
108 Positives	...	...	...	...	...	87	...	21
20 Weak positives	...	...	...	...	...	4	...	16
78 Negatives	...	...	...	...	...	5	...	73
44 Anti-complementary sera	...	...	...	...	...	19	...	25
Percentage of agreement all positives and negatives						...	79.81	per cent.
„	„	strong positives and nega-						
		tives	...	...	...	86.21	„	
„	„	negatives	...	...	...	93.58	„	

From the above table it will be seen that the percentage of agreement with the Wassermann test is high, 86.21 per cent. Young found that 93.03 per cent. of agreement with the Wassermann test is 5,080 examinations.

The histories accompanying the specimens received are in many cases unreliable; such items as "complains of pain in joints", "deaf", "denies venereal history" are common. The notes of the five cases giving positive results by Kahn's test, and negative by the Wassermann test are as follows:

- (1) Enlargement of epitrochlear glands. Pain in joints and bones. No mention is made of history of exposure or of scar on penis. (2) Exposure three years ago. Sore in urethra. Enlarged epitrochlear glands. Had rash. Pain in joints and bones. (3) Exposure three years ago. Chancre one month after. Enlarged epitrochlear glands. Rash six months ago. Had fever and headache. Pains in joints and bones. Had six N.A.B. injections. (4) Exposure two months ago. Sore one month after. Pains in joints and bones. Has sore on penis. Under Hg. treatment. (5) Exposure six years ago. Had no sore. Epitrochlear glands enlarged. Ulcers left leg.

Judging from the histories of these cases, one can safely say that the result in Khan's test was more likely to have been correct in three out of the five cases.

Although the number of tests is small, one feels justified in saying that in Khan's test we have a very reliable and simple test, involving no extra time or effort. It serves a useful purpose, when combined with the Wassermann test, in aiding in the diagnosis and in the control of treatment in syphilis. The results are more reliable than with other methods tried here, such as Gordon's test and the Formo-gel reaction.

YAWS.

During the year cases of yaws admitted to the Malay Hospital, Kuala Lumpur, were examined by Mr. Lesslar with the object of studying the morphology of the causative agent, *Spirochaeta pertenuis* and comparing it with *S. pallida* of syphilis.

Blanchard, Martin, Prowazek and others found slight differences between these parasites, and Martin noted that *S. pertenuis* is more slender and more difficult to stain than the spirochaete of syphilis. In fresh films examined here slight differences in the appearances of the parasites were observed. In some films the coils of the *S. pertenuis* are seen to contract and expand while in motion, like a spring in action, *S. pallida* on the other hand preserved the screw-like movement.

No difficulty was found in staining both parasites by the method of Fontana. The appearances of the parasites in stained specimens are very similar. *S. pertenuis* occasionally shows a loop at one end and in some specimens its coils are less regular. It is however only in successful animal inoculations that a definite difference can be made out.

Two rabbits were inoculated subcutaneously under the skin of the scrotum with serum from chancres containing *S. pallida*; these animals developed chancres within 44 days. Two rabbits and a guinea-pig inoculated similarly with serum containing *S. pertenuis* did not develop any signs of yaws, but a third rabbit inoculated under the skin of scrotum with a piece of tissue cut off from a yaw, developed 18 days afterwards at the site of inoculation a small nodule from which *S. pertenuis* were recovered.

In rabbits inoculated with *S. pallida*, the sores and nodules increase and attain their maximum size about the forty-fifth day after appearance of the sore; they diminish and disappear in about three months. The nodules are cartilaginous to the touch and the ulcer callous and covered with scabs. In the rabbit inoculated with *S. pertenuis* the nodule is of slow growth, elevated in appearance, soft to the touch, has no tendency to ulcerate, and is always covered with a scab. The removal of the scab leaves a smooth glistening surface with haemorrhagic points in which the *S. pertenuis* can be demonstrated.

The results confirm the observations of Nichols that rabbits can be infected with the spirochaetes of yaws and syphilis, and that the general health of the animals does not suffer. In yaws the incubation period is from two to three weeks and sometimes longer. The lesion in yaws is elevated and oedematous; in syphilis the lesion is flat and dry.

VENEREAL DISEASES.

The number of specimens received for examination by the Wassermann test was 2,652; of these 2,470 were examined, the remainder being for one reason or another unsuitable for examination. The results of the tests were as follows:

Positive	...	...	...	...	...	...	...	...	1,229
Negative	...	...	...	...	...	...	...	...	923
Anti-complementary			...	...	...	...	...	...	318
Contaminated, lysed, etc.	...		...	...	...	...	...	...	182
							Total	...	2,652

The places of origin of the specimens were as follows :

Government hospitals, Perak	...	...	...	...	...	1,199
„ „ Selangor	...	...	...	...	...	1,048
„ „ Negri Sembilan	...	...	...	...	...	115
„ „ Pahang	...	...	...	...	...	49
„ „ Kedah	...	...	...	...	...	1
Central Mental Hospital	...	...	...	...	...	61
Other practitioners	...	...	...	...	...	179
					<b>Total</b>	<b>2,652</b>



The number of specimens received for examination by the Wassermann test in preceding years is as follows :

							Total.		Positive.
1919	...	...	...	...	...	...	453	...	170
1920	...	...	...	...	...	...	1,826	...	777
1921	...	...	...	...	...	...	3,984	...	1,670

Sixty-one specimens were examined by the direct method for *Spirochaeta pallida*, of which seventeen were positive. In 1921 fifty-six were examined, of which twenty were positive.

Eighteen smears were examined for gonococci in special cases and nine were positive.

#### ENTERIC FEVERS.

Three hundred and ninety-three specimens of blood were examined by the agglutination test; 108 gave a positive reaction with *B. typhosus*, two with *B. paratyphosus A.* and eight with *B. paratyphosus B.*

The serum of a number of healthy persons who had been inoculated with T.A.B. vaccine during the war period were examined by the agglutination test. Of eighteen specimens so examined, twelve gave a positive reaction in dilutions of 1 in 60 or upwards with *B. typhosus* and two with *B. paratyphosus B.*

The "zone phenomenon" in agglutination, that is to say, failure to agglutinate in lower dilutions of serum while agglutinating in higher dilutions, was observed in seven specimens.

Throughout the year cultures on ordinary agar and smears were made from specimens of blood received for examination for enteric fevers. *B. typhosus* was isolated in seven specimens in this way and on three occasions malaria parasites were found.

#### DYSENTERY.

Twelve hundred and sixty-one specimens of faeces from cases of supposed dysentery were examined by bacteriological and microscopic methods. The results were as follows :

<i>B. dysenteriae</i> , Flexner	...	...	...	...	...	...	220
„ „ Shiga	...	...	...	...	...	...	6
<i>Entamoeba histolytica</i>	...	...	...	...	...	...	73
<i>B. typhosus</i> ...	...	...	...	...	...	...	3
<i>B. paratyphosus A.</i> ...	...	...	...	...	...	...	1
Negative	...	...	...	...	...	...	958
Total							1,261

*B. dysenteriae*, Flexner, and *B. dysenteriae*, Shiga, were both identified in one specimen and *B. dysenteriae*, Flexner, and *Entamoeba histolytica* in another.

Three hundred and forty-seven tubes on anti-dysentery serum were issued for use in treatment.

#### PLAGUE.

*B. pestis* was identified in a specimen from Petaling Street, Kuala Lumpur. The case ended fatally but there was no spread of the infection.

Rats from this area were received from the Health Officer; none of them were plague infected.

#### CHOLERA.

Eight cultures from supposed cases of cholera were received for examination. In none of them was the vibrio of Asiatic cholera identified.

#### CEREBRO-SPINAL FEVER.

Twenty-five specimens of cerebro-spinal fever were examined; in seven the meningococcus of cerebro-spinal fever was identified, in three pneumococcus.

Fifty-eight tubes of anti-meningococcus serum were issued for use in treatment.

#### DIPHTHERIA.

One hundred and sixty-three specimens were received for examination by culture of *B. diphtheriae*. In 29 cases the specific organism was identified. One other proved to be a case of Vincent's Angina with characteristic spirochaetes and fusiform bacilli in smears.

There were small outbreaks of diphtheria in Ipoh, Seremban and Port Dickson.

Two hundred and thirty-eight tubes of diphtheria anti-toxin were issued for use in treatment.

## RABIES.

The brains of 27 dogs were received for examination and in 14 of them Negri bodies were identified.

Of the positive cases nine were from Selangor and five from Malacca.

In 1921 thirteen specimens were examined of which two only proved to contain Negri bodies.

## LEPROSY.

One hundred and one specimens, smears of nasal discharge and exudate from lepra nodules, were examined. *B. leprae* was identified in 69. Most of these specimens were examined in connexion with Dr. Travers' investigations on the effect of treatment with chaulmoogra oil derivatives at the Leper Asylum, Kuala Lumpur.

Two of the cases were of special interest as there were few or no external signs of leprosy. In one of them lepra bacilli were found in the exudate from a scarcely recognisable nodule on the ear and in the other from a minute nodule on a finger. Both cases were sent for examination with a view to discharge from the asylum.

## TUMOURS.

Seventy-one specimens of tissues were received for examination. Of these four were adeno-carcinoma, six epithelioma, three carcinoma, one melanosarcoma and seven other forms of sarcoma.

## MEDICO-LEGAL.

Twenty-nine specimens of blood stains were examined by the precipitin test for human blood; of these 12 gave a positive result. One supposed seminal stain was examined with a negative result.

## MISCELLANEOUS.

There were 1,445 miscellaneous examinations, urine for quinine, blood films for parasites, sputum for tubercle bacillus, and other tests of the order of clinical laboratory examinations.

Autogenous vaccines were prepared from forty-five cases.

Two hundred and thirty-four tubes of tetanus anti-toxin and 119 tubes of anti-streptococcus serum were issued for use in treatment.

## CHEMICAL LABORATORIES AND MALARIA BUREAU.

Reports on the work of the Chemical Laboratories by Mr. R. W. Blair, Chemist-in-Charge, and on the Malaria Bureau by Dr. H. P. Hacker, Malaria Research Officer, are appended.

## ACKNOWLEDGMENTS.

We are under special obligation to Dr. A. A. Woods and the staff of the District Hospital, Kuala Lumpur, and to Dr. E. A. O. Travers, Medical Officer, General Hospital, for generous assistance in the provision of material for study in connexion with special investigations. We are also indebted to fellow workers in the laboratories of Singapore, Bangkok (Siam), Batavia (Java), Muktesar (India), and the Lister Institute (London) for materials received from them during the year. Lt.-Col. A. T. Gage, I.M.S., was good enough to send us a series of exhibits illustrating processes for the preparation of quinine and cinchona febrifuge from cinchona bark.

## STAFF.

Dr. A. T. Stanton, Director of Government Laboratories, resumed duty on return from leave on March 7th.

Miss M. W. Jepps, Protozoologist, returned to England on completion of the period of her engagement on October 5th.

Mr. S. Visuvalingam, Assistant Surgeon, attached to the Institute temporarily, resumed duty in the hospital service on April 18th.

Mr. P. Kailasam and Mr. V. Chinniah, Probationers, left on 31st May and 31st October, respectively, and Mr. Tan Seng Poh was appointed Probationer with effect from February 1st.

A. T. STANTON,

*Director of Government Laboratories, F.M.S.*



ANNUAL REPORT OF THE CHEMICAL LABORATORIES, INSTITUTE FOR  
MEDICAL RESEARCH, FEDERATED MALAY STATES, FOR THE YEAR  
1922.

Chemical work for the following departments is carried out in the Chemical Laboratories: Medical, Trade and Customs, Police, Railways and Public Works.

The total number of samples examined during the year was 2,702 as compared with 5,321 in the preceding year. The decrease is principally in samples of counterfeit coins and liquors.

I.—MEDICAL DEPARTMENT.

The work for this department consists mainly in the examination of samples of milk, water and toddy.

The total number of samples examined was 1,470.

(a) MILK.

The total number of samples examined was 657 as compared with 466 in 1921; 637 were samples of fresh milk and 20 of condensed milk.

The majority of the samples of fresh milk were collected under the provisions of "The Sale of Food and Drugs Enactment, 1913". In 82 cases certificates were issued, 73 for deficiency in non-fatty solids and 9 for deficiency in fat.

The details of the results are as follows:

State.	Number.	Reported against.	Per cent.
Selangor ... ..	338	49	14.5 per cent.
Perak ... ..	285	36	12.7 „
Negri Sembilan ... ..	7	3	42.8 „
Pahang ... ..	7	1	14.2 „

Twenty samples of condensed milk were analysed, these consisted of samples of milk powders, unsweetened and sweetened condensed milks.

(b) BUTTER.

Two samples of butter were examined, one was found to contain foreign fat.

(c) WATERS.

Chemical analyses were carried out on 331 samples and Bacteriological analyses on three samples of water.

One sample of alumina ferric was examined.

Growths from two reservoirs were examined.

*Kuala Lumpur Supply.*—The raw waters from the Impounding Reservoir and the Intake Works at Ampang, and the filtered waters from the Maxwell's Hill and Weld Hill Reservoirs were examined weekly.

The raw waters are filtered through sand filter beds.

The improvement is very much higher in the case of the Maxwell's Hill Reservoir than the Weld Hill.

The results of the examinations are detailed in Table 1.

The following water supplies were visited and reported upon:

Klang Supply (Subang Reservoir and Ayer Kuning Reservoir).

Kuala Lipis Supply (Sungei Chenras Reservoir).

Bentong Supply.

Raub Supply.

*Klang Supply.*—The Klang supply is at present unfiltered, and recommendations were made for the filtration of this supply.

Finally, the treatment of the supply with liquid chlorine was decided upon.

Arrangements have been made to obtain an apparatus for chlorinating water from the Paterson Engineering Co., India.

This installation will be the first of its kind in the Federated Malay States.

Results in India and England have been very satisfactory.

*Kuala Lipis Supply.*—The supply is unfiltered.

The Reservoir at Sungei Chenras was visited and was found to be in a very dirty state due to the excessive algal growths—principally *Chara*. *Chara* produces oily matters with offensive smell. Removal of it has been carried out by hand.

Treatment with copper sulphate has been recommended.

*Bentong Supply and Raub Supply.*—These two supplies were visited and on inspection were satisfactory. Both supplies are unfiltered.

## (d) TODDY.

Four hundred and fifty-one samples of toddy have been examined.

Of these seven were found to contain more than 0.8 per cent. of acid calculated as acetic acid.

No sample contained more than 10 per cent. absolute alcohol by volume.

## (e) OILS.

Four samples of castor oil for medicinal use, and two samples of Chaulmoogra oil were examined.

## (f) MISCELLANEOUS SAMPLES.

The miscellaneous samples numbered 17.

Five were samples of urine, two of test meals, and two of faeces.

The remaining samples were as follows:

Tincture (1), bean curd (1), tinned cauliflower (1), vinegar (1), cinchona febrifuge (1), seeds of *Strychnos nux vomica* (1), Chinese medicine (1).

## (g) VITAMIN B EXTRACT.

This extract, for use in the treatment of cases of beri-beri, is prepared in the Laboratories.

During the year 1922, 2,350 fluid ounces have been prepared, of which 1,988 fluid ounces have been issued to Government hospitals.

## II.—TRADE AND CUSTOMS DEPARTMENT.

Work for this department consists chiefly in the examination of liquors in connection with the assessment of duty and the examination of samples of chandu, chandu dross, and deleterious drugs collected under the Chandu and Deleterious Drugs Enactment.

The total number examined was 719.

(a) *Liquors*.—The percentage of alcohol was determined in 251 samples, nine samples were examined for denaturants, all of which contained the necessary ingredients.

(b) *Toddy*.—The acidity expressed as acetic acid and the percentage of alcohol were determined in 54 samples of toddy.

(c) *Chandu*.—Ninety-eight suspected samples were forwarded by Officers of the Chandu Monopoly Department; of these 60 were samples of chandu of Government manufacture, and ten contained illicit opium.

In ten samples chandu mixed with other substances was present.

In the remaining samples, no morphine or salt of morphine was found.

(d) *Chandu Dross*.—Of the 224 samples received, 192 were examined for the Chandu Monopoly Department.

The samples were graded according to their morphine content.

The results were as follows:

Grade	I	...	...	...	...	79
„	II	...	...	...	...	74
„	III	...	...	...	...	37

In two samples, no chandu was found.

(e) *Deleterious Drugs*.—Of the 71 samples examined, 61 contravened the provisions of the Enactment, in each case the alkaloid found being morphine.

(f) *Alum*.—Eleven suspected samples were received, all of which on analysis were found to contain alum.

(g) *Hydrometer*.—One Sikes's hydrometer, for ascertaining the strength of spirit, for use in the Customs Department, was tested as to its accuracy.

## III.—POLICE DEPARTMENT.

The work for this department includes the examination of stains for blood, exhibits for poison, coins and liquors.

(a) *Counterfeit Coins and Counterfeiting Materials*.—Under this heading, 261 exhibits were received, of which 131 were counterfeit coins, 88 genuine coins, 19 moulds used in the manufacture of coins, 12 pieces of metal, and 10 substances.

In the majority of cases, the metal of the counterfeit coins was an alloy of the same composition as that found in bulk and in the melting pots in the dwelling places of the suspected coiners.

(b) *Stains*.—Of the 76 exhibits examined for blood, positive results were obtained in 25 cases only.



The precipitin test was carried out on 22 specimens of blood stains, of which 9 gave the reaction characteristic of human blood.

The details are given below :

Exhibits.		Number.	Blood stained.	Human Blood.
Knives, parangs, etc.	... ..	24	9	3
Articles of clothing	... ..	38	13	5
Wood, metals, etc.	... ..	14	3	1
Total	... ..	76	25	9

In addition, six articles of clothing were examined for seminal stains.

(c) *Toxicological Analyses*.—Fifty-three analyses were carried out.

The number of human poisoning cases investigated was 19, animal poisoning cases 6.

The miscellaneous articles examined for poison numbered 28.

*Human Poisoning*.—In nine cases, poison was detected in the viscera.

Potassium Cyanide: In three cases of suicide, potassium cyanide was found.

Hydrochloric Acid: In two cases of accidental poisoning, hydrochloric acid was detected. In one of the cases an estate cooly drank some liquid called “Coagulatex”, a mixture of hydrochloric and sulphuric acids for coagulating rubber.

Caustic Soda: A case of suicide. A large quantity had been taken. The post-mortem signs were similar to those in poisoning by corrosive acids.

Corrosive Sublimate: Accidental poisoning. A peon in a dispensary took some corrosive sublimate in mistake for magnesium sulphate.

*Animal poisoning*.—The viscera from five animals were examined for arsenic, no arsenic being found.

The vomited matter from one bullock was found to consist chiefly of caustic soda.

*Exhibits for Poison*.—Twenty-eight exhibits were examined.

Poison was detected in five exhibits as follows :

Potassium cyanide (2), caustic soda (2), hydrochloric acid (1).

Some seeds, which had been bought in a native shop, were identified as seeds of *Strychnos Nux Vomica*.

A plant called by the Malays “*Siak-Siak*” and stated to be used by them as a rat poison was identified as *Dianella Ensifolia*. The roots of this plant contained numerous crystals of calcium oxalate.

In three white powders examined in connection with a case of robbery, lime was found to be present. Some of the powder had been thrown in the face of the victim to produce temporary blindness.

(d) *Liquors*.—Fifty-one samples were received for the determination of alcoholic strength.

(e) *Toddy*.—Twenty-four suspected samples were received, all of which proved to be samples of toddy.

(f) *Deleterious Drugs*.—Fourteen suspected samples were examined, all of which were found to contain morphine hydrochloride.

(g) *Miscellaneous Exhibits*.—Three exhibits were found to contain Ganja, i.e., *Cannabis Indica*.

Two exhibits were bombs, in which the explosive used was gelignite. These bombs, it is alleged, are made by Chinamen for use in gang-robberies.

#### IV.—OTHER DEPARTMENTS.

Fifteen exhibits were received.

Of these, 12 were samples of rice from the Department of Agriculture, 1 sample of varnish from the Electrical Department, 1 sample of sulphuric acid from the Posts and Telegraphs Department, and the contents of a axle-box from the Railway Department.

#### V.—PRIVATE ANALYSES.

Eight analyses were carried out under this heading as follows :

Water (2), coins (2), spirits (2), milk (1) and tincture of iodine (1).

The fees received for these analyses amounted to \$180.

#### LEGAL PROCEEDINGS.

Members of the staff gave evidence in legal proceedings in 29 cases.

R. W. BLAIR,  
*Chemist-in-Charge.*

TABLE 1.

Month.		Impounding Reservoir. (Raw Water.) Parts per 100,000.						Intake Works, Ampang. (Raw Water.) Parts per 100,000.							
		Ammoniacal nitrogen.	Albuminoid nitrogen.	Oxygen absorbed 3 hrs.	Chlorine.	Total solids.	Oxidized nitrogen.	Rainfall in inches.	Ammoniacal nitrogen.	Albuminoid nitrogen.	Oxygen absorbed 3 hrs.	Chlorine.	Total solids.	Oxidized nitrogen.	Rainfall in inches.
January	...	.0007	.0128	.1578	.07	4.00	.002	9.92	.0006	.0053	.1598	.07	4.50	.003	11.52
February	...	.0004	.0111	.1517	.06	3.75	.003	3.13	.0006	.0058	.1729	.06	3.50	.002	2.92
March	...	.0013	.0121	.1526	.06	4.50	.002	14.70	.0009	.0054	.1852	.06	4.00	.004	14.96
April	...	.0009	.0123	.1633	.07	4.00	.004	4.90	.0005	.0056	.1613	.06	3.15	.004	5.40
May	...	.0001	.0115	.1662	.07	4.00	.004	8.21	.0006	.0059	.1835	.06	4.50	.004	10.57
June	...	.0013	.0132	.1657	.07	4.00	.003	6.76	.0007	.0095	.2091	.06	...	...	3.52
July	...	.0009	.0159	.1618	.08	5.50	.002	3.49	.0007	.0059	.1500	.06	2.50	.004	2.40
August	...	.0009	.0146	.1553	.10	...	.002	4.73	.0005	.0055	.1281	.07	...	.004	7.70
September	...	.0009	.0128	.1672	.07	4.25	.002	6.40	.0005	.0051	.1532	.07	4.00	.006	3.98
October	...	.0006	.0146	.1663	.08	...	.004	12.84	.0008	.0076	.2089	.06	...	.004	15.85
November...	...	.0007	.0126	.1843	.07	6.00	.004	10.19	.0007	.0090	.1887	.06	4.50	.003	15.36
December ...	...	.0015	.0139	.1765	.08	4.00	.002	11.60	.0007	.0099	.2137	.06	4.00	.006	16.42
Averages ...	...	.0009	.0131	.1641	.07	4.40	.003	8.07	.0006	.0067	.1762	.06	3.85	.004	9.22

Month.		Maxwell's Hill Reservoir. (Filtered Water.) Parts per 100,000.						Weld Hill Reservoir. (Filtered Water.) Parts per 100,000.					
		Ammoniacal nitrogen.	Albuminoid nitrogen.	Oxygen absorbed 3 hrs.	Chlorine.	Total solids.	Oxidized nitrogen.	Ammoniacal nitrogen.	Albuminoid nitrogen.	Oxygen absorbed 3 hrs.	Chlorine.	Total solids.	Oxidized nitrogen.
January	...	.0000	.0042	.0883	.07	3.00	.008	.0000	.0039	.1230	.06	4.00	.003
February	...	.0001	.0041	.0704	.06	3.75	.006	.0000	.0041	.1111	.06	3.50	.003
March	...	.0000	.0039	.0913	.07	3.50	.006	.0003	.0047	.1433	.06	3.50	.004
April	...	.0003	.0038	.0780	.07	2.50	.006	.0000	.0037	.1143	.06	4.50	.006
May	...	.0000	.0039	.0797	.07	3.00	.008	.0000	.0044	.1446	.06	4.00	.004
June	...	.0000	.0056	.0841	.07	3.75	.004	.0000	.0053	.1335	.06	...	.006
July	...	.0000	.0053	.0793	.07	4.00	.006	.0000	.0050	.1329	.06	2.00	.006
August	...	.0001	.0042	.0610	.06	...	.008	.0004	.0052	.1287	.06	...	.006
September...	...	.0001	.0057	.0980	.06	4.75	.006	.0000	.0046	.1280	.06	3.75	.006
October	...	.0000	.0052	.0904	.07	...	.006	.0001	.0059	.1606	.06	...	.004
November ...	...	.0001	.0048	.0867	.05	1.50	.008	.0001	.0050	.1400	.05	3.25	.005
December ...	...	.0004	.0051	.0950	.06	4.25	.006	.0002	.0057	.1343	.06	3.00	.006
Averages ...	...	.0001	.0047	.0835	.07	3.40	.007	.0001	.0048	.1329	.06	3.50	.005



## APPENDIX A.

## Total number of Analyses and Examinations made in the Chemical Laboratories during the year 1922.

## MEDICAL DEPARTMENT.—

	Number of Analyses.							
Milk ... ..	...	...	...	...	...	...	...	637
Condensed milk ... ..	...	...	...	...	...	...	...	20
Butter ... ..	...	...	...	...	...	...	...	2
Waters, chemical ... ..	...	...	...	...	...	...	...	331
Waters, bacteriological ... ..	...	...	...	...	...	...	...	43
Toddy . ... ..	...	...	...	...	...	...	...	451
Oils, fixed ... ..	...	...	...	...	...	...	...	6
Miscellaneous ... ..	...	...	...	...	...	...	...	20

## TRADE AND CUSTOMS DEPARTMENT.—

Liquors ... ..	...	...	...	...	...	...	...	260
Toddy ... ..	...	...	...	...	...	...	...	54
Chandu ... ..	...	...	...	...	...	...	...	98
Chandu dross ... ..	...	...	...	...	...	...	...	224
Deleterious drugs ... ..	...	...	...	...	...	...	...	71
Alum ... ..	...	...	...	...	...	...	...	11
Hydrometer ... ..	...	...	...	...	...	...	...	1

## POLICE DEPARTMENT.—

Counterfeit coins and counterfeiting materials ... ..	...	...	...	...	...	...	...	261
Articles for blood stains ... ..	...	...	...	...	...	...	...	76
Articles for seminal stains ... ..	...	...	...	...	...	...	...	6
Toxicological analyses ... ..	...	...	...	...	...	...	...	53
Liquors ... ..	...	...	...	...	...	...	...	51
Toddy ... ..	...	...	...	...	...	...	...	24
Deleterious drugs ... ..	...	...	...	...	...	...	...	14
Miscellaneous ... ..	...	...	...	...	...	...	...	5

## OTHER DEPARTMENTS.—

Miscellaneous ... ..	...	...	...	...	...	...	...	15
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## PRIVATE ANALYSES.—

Waters ... ..	...	...	...	...	...	...	...	2
Coins ... ..	...	...	...	...	...	...	...	2
Milk ... ..	...	...	...	...	...	...	...	1
Spirits ... ..	...	...	...	...	...	...	...	2
Tincture ... ..	...	...	...	...	...	...	...	1

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Total ... 2,702

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## REPORT OF THE SENIOR HEALTH OFFICER, FEDERATED MALAY STATES, FOR THE YEAR 1922.

### STAFF.

At present the European staff consists of:

- 1 Senior Health Officer;
- 3 permanent Health Officers;
- 1 Health Officer on agreement;
- 4 Medical Officers of the permanent staff;
- 2 temporary Medical Officers;
- 8 Chief Sanitary Inspectors.

The duties of the Health Department include:

A.—Work under—

- (1) Quarantine and Prevention of Disease Enactment;
- (2) Sanitary Boards Enactment;
- (3) Labour Code;
- (4) Sale of Food and Drugs Enactment;
- (5) Excise Enactment.

B.—Malaria investigation, anti-malarial measures and anti-mosquito measures.

C.—General, water and water-borne diseases, flies-prevalent diseases, schools examination.

### QUARANTINE AND THE PREVENTION OF DISEASE.

Responsibility under the Quarantine and Prevention of Disease Enactment was shared with the Medical Branch.

#### PORT SWETTENHAM.

During the year health work at Port Swettenham, including that in connection with the quarantine station, was carried on by the Health Branch.

Forty-three ships with immigrant coolies were boarded during the year by the Health Officer or Deputy Health Officer. Six ships were infected with smallpox. There being no Clayton apparatus at the port, the ships proceeded to Singapore for disinfection.

The number of immigrants who entered the quarantine station during the year was 27,437, the number remaining on the 1st January, 1922, was 168, making a total of 27,605.

The largest number on any one day was 2,833 on September 10th.

Four thousand and thirty-three immigrants received routine, anti-ankylostome treatment.

The number of infectious cases were: Smallpox 1, chicken-pox 18, measles 80, mumps 3, influenza 563.

During the year 1,301 immigrants were treated in the Camp hospital.

The total number of deaths was 67 or 0.24 of those quarantined.

Influenza complicated by pneumonia was responsible for 52 out of the 67 deaths.

Vaccine therapy with a strain of B influenzae prepared by the Institute of Medical Research was tried with some cases. The following table shows the results attained:

	Period.	No. of cases in observation ward.	No. requiring hospital treatment.	No. developed pneumonia.	Percentage of incidence of pneumonia.	No. of deaths from pneumonia.	Percentage of pneumonia deaths to influenza cases treated.
Vaccinated ...	1-3-22	1,677	348	72	4.2	8	0.47
	to						
Unvaccinated ...	30-9-22	171	171	44	25.73	12	7.01

There being plenty of space available in the Camp, certain decrepits and unemployed collected by the Labour Department were housed, fed, and given medical treatment.

All were given routine treatment for ankylostomiasis and kept on a quinine iron and arsenic tonic.



TOWN DISPENSARY, PORT SWETTENHAM.

Four thousand two hundred and ninety-eight out-patients received treatment, of whom 383 were Malays. The number treated in 1921 was 3,509. Eight hundred and thirty-four cases of "Fever" were treated.

INFECTIOUS DISEASES.

In this report infectious disease means cholera, plague, smallpox and cerebro-spinal meningitis. Measures against infectious disease are taken by both the Health Branch and the Medical Branch. No cases of cholera were reported. One case of plague occurred in Selangor. There were 16 cases of smallpox, of which 13 occurred in Perak and one in Selangor and two in Negri Sembilan. Eighteen cases of cerebro-spinal meningitis were reported—three from Perak, ten from Selangor, four from Negri Sembilan and one from Pahang.

WORK UNDER THE SANITARY BOARDS ENACTMENT.

The Sanitary Boards Enactment is very comprehensive and if carried out to its fullest extent ensures a high state of sanitation in housing, water supplies and refuse and night-soil disposal. It also provides for the suppression of mosquitoes, especially of those kinds which carry malaria.

The amount of supervision given by the Health Officer to Sanitary Board work differs in different areas and depends largely upon the amount of control delegated by the Chairman. In Kuala Lumpur the Health Officer carries on very much as does the Medical Officer of Health of an English town, in Ipoh and other towns the case is different.

LABOUR CODE.

The Health Branch and the Labour Department co-operated throughout the year.

The number of estates sending in returns was 1,279; in addition there are a large number under 100 acres each which do not send returns.

The number of estate hospitals was 165.

Under the Labour Code the duties of a Health Officer are to inspect on behalf of the Government and to report whether the sanitary conditions prescribed by the Government for the protection of the labourers are being carried out.

It has been laid down that the responsibility for the protection of health and the cure of disease lies with the employer and it is up to him to engage the staff necessary for the purpose.

Details of the distribution of estates and hospitals and the frequency of visits by Health Officers are given in the table below :

State.	District.	Estates.		Estate Hospitals.	
		No.	No. of visits by Health Officer.	No.	No. of visits by Health Officer.
Perak, 620 ... ..	{ Perak North ... ..	273	107	25	45
	{ Kinta ... ..	127	65	6	6
	{ Perak South ... ..	220	144	26	45
Selangor, 372 ... ..	{ Selangor East ... ..	193	226	22	29
	{ Selangor Coast ... ..	179	133	34	40
Negri Sembilan, 250 ... ..	All districts ... ..	250	83	44	42
Pahang, 55 ... ..	" " ... ..	55	69	8	14
Total, F.M.S. ... ..		1,297	827	165	221

Mines and Sanitation.—The average mining population for the year was 82,195.

Mines are not required to send in sickness and death returns and the sick-rates and death-rates are unknown.

FOOD AND DRUGS.

Work under the Sale of Food and Drugs Enactment forms an important part of the duties of a Health Officer in temperate climes, and the same should apply here. With the exception of the examination of milks and the seizure and condemnation of bad tinned food little is done under this heading.

TODDY.

Watch is kept on toddy-shops and samples are taken for analysis. Where samples are below the standard laid down by law the vendors are prosecuted.

## SCHOOL INSPECTION.

This year schools inspection was added to the duties of the Health Officer. There are 527 schools on the Education Department's list, and there are many more private native schools which are not on that list. Some of the schools are on the main line of communication; others are not easily reached. An arrangement was made between the Medical Branch and the Health Branch by which the former undertook to visit all schools in Sanitary Board areas, the latter all schools on estates. With regard to the kampong schools it was mutually agreed that the Medical Branch would do what it could and the Health Branch the rest.

A working syllabus was drawn up and schedules printed. When an officer visits a school the schedule is filled in in quadruplicate—one copy is sent to the Senior Health Officer, one copy to the Senior Medical Officer, one copy to the Inspector of Schools and one copy is filed.

## MALARIA AND MALARIA PREVENTION.

As usual malaria heads the list as the most important cause of sickness and death. The number of deaths from fever recorded was 15,570. The death-rate, the lowest for ten years was 11.44 per mille or 44 per cent. of the general death-rate. Malaria was an essential factor in many deaths attributed to other causes. It is impossible to say what malaria cost this country in 1922, but taking into account the loss of energy due to sickness, invaliding and death, the check to the natural population increase through the lowering of the birth-rate, and the dampening effect on recruiting, the loss in dollars must run into seven figures.

Malaria is preventible but at a cost—whether that cost is justified in any case depends on the local factors. Malaria prevention is a sound economic problem where groups of people are gathered together as in a town, villages and estates.

The anti-malarial activities of the Health Department during the year included—the teaching of mosquitology, propaganda, investigation and research, anti-mosquito measures, quinine distribution.

The teaching of mosquitology continued throughout the year. All the Inspectors are trained in both laboratory and field work and are competent to make anopheline surveys. Estate managers have been encouraged to send their dressers for free courses of instruction.

Lectures and lantern demonstrations have been given in schools and kampongs. Cards and posters have been distributed.

In every district there have been numerous mosquito surveys. The arrangement by which medical men, estate managers and others can obtain free advice and assistance in anti-malarial problems continued.

Experiments have been made to find out a suitable quick growing cover for cleared valleys, the haunt of *Maculatus*.

In Pahang trials with a form of mimosa appear to have been successful but it is too early to express an unqualified opinion. The experiments will be continued in 1923.

Trials with different oils as larvicides have been made and the general opinion appears to be that the best for the purpose (taking into account both lethal properties and cost) is a mixture of equal parts of Solar oil and liquid fuel.

A large stock of quinine was obtained from England in the form of four-grain tablets enclosed in glass tubes each containing 20 units. The central store is at the Senior Health Office. Distribution is made through the District Health Offices to the school authorities, the police and others. This practice has been satisfactory. No charge is made for the drug.

A spleen census was taken on every estate visited and in every school inspected. Oiling and minor draining has been done in many places with beneficial result. Probably the most striking case of the benefit of anti-mosquito work in the eradication of malaria is that of Gemas, which was fever stricken, but which is now so much improved that complaints are rare. The result has been brought about chiefly through the co-operative efforts of the Railway Engineers and the Health Department.

The European Chief Sanitary Inspectors have taken a great interest in the mosquito problems and have proved their worth over and over again. The Asiatic Inspectors have afforded valuable assistance, but I do not think I am doing them an injustice when I say that the energies of the average man are more persistently employed when acting with the European Inspector than when working alone. The Health Staff, the Malaria Engineering Staff and the Malaria Research Staff have worked in harmony and have been mutually helpful.



*Malaria Advisory Board.*—The Board met monthly and the minutes of the meeting were published. Propaganda posters were printed and distributed, and propaganda articles and notices were published in the newspapers.

*Mosquito Destruction Boards.*—These local Boards of which there is one for each district continued to functionate.

Composed of non-officials and officials the Boards have done much to stimulate local interest in anti-mosquito measures. Mistakes were made in some places, but these were put right. These mistakes have emphasised the fact that the elimination of mosquitoes as a means of eradicating malaria is an entomological problem, and that no scheme of any magnitude has any chance of success unless framed and carried out under the supervision of those familiar with the habits and life history of the species it is intended to get rid of.

Work in connection with Mosquito Destruction Boards took up much of the time of the Health Officers. That the Boards have been a success cannot be questioned. They have aroused local interest and have paved the way for real progress in anti-malarial work. What is wanted is not less Boards, but more trained Health Officers, so that there shall be sufficient staff for both anti-malarial measures and other health work.

#### WATER AND WATER-BORNE DISEASES.

Most of the water supplies of this country are subject to considerable risk of pollution. The waterworks of all towns which possess such are under control of the Public Works Department.

It is difficult to convince the native of the value of water protection. Hundreds of wells have been provided with covers and pumps, but in few cases have they remained so protected for more than a month or two.

Dysentery and diarrhoea rank next to but away behind malaria as a cause of death. There were 2,419 deaths from these diseases, giving a death-rate of 1.78 per mille. This is the lowest for the last ten years. As the rates in the urban districts, supplied with piped filtered water are higher than those for the whole country it is clear that the drinking water supply is not the only factor involved. The other factors are food contaminated by personal contact or by flies.

#### PULMONARY TUBERCULOSIS.

The total number of deaths was 2,393—the rate was 1.76 per mille. This disease is one of urban rather than of rural areas. The rates for the four large towns were: Taiping 4.96, Seremban 4.02, Kuala Lumpur 3.32, Ipoh 2.54. Pulmonary tuberculosis thrives in dark ill-ventilated houses, especially if there be overcrowding. The supply of tubercle bacilli is kept up by the disgusting habit of spitting on the floors. Houses can be made light and airy by law but the practice of spitting in a private house can only be stopped by education. There are still many houses below the standard required by the Sanitary Board law both as regards lighting and ventilation. Many of the houses are overcrowded.

#### ANKYLOSTOMIASIS.

The number of deaths attributed to this disease was 533, giving a death-rate of 0.41 per mille. Practically all the natives harbour the worm, but cases showing a noticeable amount of anaemia are, in the absence of malaria, not common. Why ankylostomiasis is not a greater cause of sickness and death in this country has not been worked out. The general disregard of sanitary principles in the practice of defaecation, especially among the Tamils who form the bulk of the population on estates, would lead one to expect far more trouble from this disease than is actually experienced.

#### INFANTILE MORTALITY.

There were 5,963 deaths of children under one year of age. The infantile mortality rate or rate per 1,000 births was 170.83. The rate for 1921 was 183. The rate for England in 1919 was 89. The high mortality is chiefly due to ignorance and carelessness on the part of the native mothers.

The Infantile Welfare Advisory Board was formed for the purpose of advising as to the methods which should be employed to promote the welfare of infants and to reduce the infantile mortality rate.

An Infant Welfare Centre was started in Kuala Lumpur under the direction of a Lady Medical Officer assisted by a European Nurse specially trained in infant welfare work. At this centre children are treated and mothers are instructed. There are two midwives attached to the centre whose duties are to visit newly delivered mothers, offer advice and render assistance. Every endeavour is made to gain the confidence of the native women in the hope that they will in time look on the Welfare Centre as the natural place to come to for advice and instruction in the upbringing of their infants. The results already attained are very encouraging and reflect great credit on the Lady Medical Officer and her staff.

#### VITAL STATISTICS (FEDERAL).

##### POPULATION.

The population of the Federated Malay States as estimated was at the end of June, 1922, 1,360,876.

The race distribution was as follows :

Europeans and Americans	...	...	...	...	...	5,986
Eurasians	...	...	...	...	...	3,274
Malays and other races of the Archipelago	...	...	...	...	...	522,069
Chinese	...	...	...	...	...	502,210
Indians	...	...	...	...	...	321,813
Others	...	...	...	...	...	5,524
Total						1,360,876

##### BIRTHS.

Thirty-four thousand nine hundred and six births were registered during the year, giving a birth-rate of 25.65 per mille population. In 1921 the number was 36,294 and the rate 27.81.

Race.	No. of births.	Birth-rate.
Europeans and Americans	153	25.56
Eurasians	102	31.15
Malays and other races of the Archipelago	18,896	36.19
Chinese	8,723	17.37
Indians	6,931	21.54
Others	101	18.28

##### DEATHS.

Thirty-five thousand and twenty-eight deaths were registered, giving a death-rate of 25.74 per mille. The rate for 1921 was 29.18.

The distribution of deaths among the several races was as follows :

Race.	No. of deaths.	Death-rate.
Europeans and Americans	39	6.52
Eurasians	44	13.41
Malays and other races of the Archipelago	12,706	24.34
Chinese	12,374	24.64
Indians	9,741	30.27
Others	124	22.45

The death and death-rates for the total population for the last ten years were as follows :

Year.	Population.	Deaths.	Rate per mille.
1913	1,117,625	38,000	34.00
1914	1,136,500	39,000	34.31
1915	1,172,336	33,899	28.92
1916	1,208,177	36,985	30.60
1917	1,244,018	42,514	34.17
* 1918	1,279,859	67,639	52.85
1919	1,315,700	38,645	29.37
1920	1,351,541	43,705	32.34
1921	1,304,825	38,077	29.18
1922	1,360,876	35,028	25.74

\* High figure due to Influenza Epidemic.



TABLE SHOWING CAUSES OF DEATHS IN 1922.

Diseases.	No. of deaths.	Rate per mille.
Malaria ... ..	15,570	11.44
Dysentery and diarrhoea ... ..	2,419	1.78
Pneumonia ... ..	1,780	1.31
Pulmonary tuberculosis ... ..	2,393	1.76
Ankylostomiasis ... ..	553	0.41
Beri-beri ... ..	443	0.33
Syphilis ... ..	107	0.08
Enteric ... ..	26	0.01
Tetanus ... ..	31	0.02
Diphtheria ... ..	12	0.01
Convulsions ... ..	3,268	2.40
Other diseases ... ..	8,426	6.19

The following table shows the deaths and death-rates from the principal diseases for the last ten years :

Year.	Malaria.		Dysentery and diarrhoea.		Pulmonary tuberculosis.		Beri-beri.	
	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.
1913 ...	16,414	14.69	5,317	4.75	1,623	1.45	1,190	1.06
1914 ...	13,634	11.99	5,235	4.60	1,655	1.45	1,223	1.07
1915 ...	15,208	12.97	3,148	2.63	1,995	1.70	871	.74
1916 ...	17,627	14.58	3,197	2.64	2,193	1.81	757	.62
1917 ...	18,750	15.07	4,942	3.97	2,446	1.96	1,207	.97
*1918 ...	31,515	24.62	4,280	3.34	3,184	2.48	1,277	.98
1919 ...	16,975	12.90	3,712	2.82	2,445	1.86	939	.71
1920 ...	20,595	15.24	3,804	2.81	2,634	1.95	431	.32
1921 ...	17,168	13.16	2,999	2.30	2,255	1.73	422	.32
1922 ...	15,570	11.44	2,419	1.78	2,393	1.76	443	.33

VITAL STATISTICS (*State figures for comparison*).

*Estimated population of all races on June 30th, 1922.*

State.	Europeans and Americans.	Eurasians.	Malays and other natives of the Archipelago.	Chinese.	Indians.	Others.	Total.
Perak ... ..	2,128	989	244,140	225,508	137,422	1,992	612,179
Selangor ... ..	2,607	1,639	95,141	173,159	139,855	1,980	414,381
Negri Sembilan ... ..	955	526	78,636	68,212	35,584	919	184,832
Pahang ... ..	296	120	104,152	35,331	8,952	633	149,484
Total, F.M.S. ...	5,986	3,274	522,069	502,210	321,813	5,524	1,360,876

VITAL STATISTICS (*State figures for comparison*).*Births Table.*

State	No. of births.	Birth-rate per 1,000 living.	1921 birth-rates.
Perak ... ..	16,278	26.59	28.01
Selangor ... ..	9,795	23.64	25.84
Negri Sembilan ... ..	4,546	24.60	28.19
Pahang ... ..	4,287	28.68	32.33

\* Influenza Epidemic year.

*Birth Statistics of different nationalities.*

State.	Europeans and Americans.		Eurasians.		Malays and other races of the Archipelago.		Chinese.		Indians.		Others.	
	Births.	Birth-rate.	Births.	Birth-rate.	Births.	Birth-rate.	Births.	Birth-rate.	Births.	Birth-rate.	Births.	Birth-rate.
Perak ... ..	64	29.81	27	27.03	8,950	36.55	4,165	18.41	3,037	21.53	35	17.56
Selangor ... ..	76	29.15	48	29.29	3,567	37.47	2,886	16.67	3,204	22.91	14	7.07
Negri Sembilan ... ..	9	9.44	24	44.94	2,817	36.36	1,087	15.93	566	15.90	43	47.36
Pahang ... ..	4	13.51	3	25.00	3,562	34.20	585	16.56	124	13.85	9	14.22

VITAL STATISTICS (*State figures for comparison*).*Deaths Table.*

State.	No. of deaths.		Death-rate.		1921 death-rates.	
Perak... ..	15,871	...	25.93	...	27.68	...
Selangor ... ..	10,487	...	25.31	...	29.64	...
Negri Sembilan ... ..	4,917	...	26.60	...	31.94	...
Pahang ... ..	3,753	...	25.11	...	30.70	...
Total, F.M.S. ...	35,028	...	25.74	...	29.18	...

*Deaths and Rates of different nationalities.*

State.	Europeans and Americans.		Eurasians.		Malays and other natives of the Archipelago.		Chinese.		Indians.		Others.	
	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.
Perak ... ..	15	6.99	19	19.02	5,898	24.09	5,973	26.40	3,913	27.74	53	26.59
Selangor ... ..	23	8.82	16	9.76	2,272	23.88	4,004	23.12	4,155	29.71	17	8.59
Negri Sembilan ... ..	1	1.05	7	13.11	1,910	24.66	1,543	22.63	1,409	39.60	47	51.76
Pahang ... ..	...	...	2	16.67	2,626	25.21	854	24.17	264	29.49	7	11.06

*Table showing deaths and death-rates from principal diseases.*

State.	Malaria.			Dysentery and diarrhoea.			Pulmonary tuberculosis.			Beri-beri.		
	Deaths.	Rate.		Deaths.	Rate.		Deaths.	Rate.		Deaths.	Rate.	
		1922.	1921.		1922.	1921.		1922.	1921.		1922.	1921.
Perak ... ..	7,521	12.29	13.32	879	1.42	1.54	1,131	1.83	1.78	89	0.15	0.12
Selangor ... ..	4,127	9.96	11.80	989	2.39	3.29	827	2.00	1.85	140	0.34	0.30
Negri Sembilan ... ..	2,113	11.51	13.07	440	2.40	3.42	310	1.69	1.68	118	0.64	0.92
Pahang ... ..	1,809	12.10	16.61	111	0.74	1.19	125	0.84	1.18	96	0.64	0.46

*Infantile Mortality Table.*

State.	Deaths of children under one year of age.						Death-rate per 1,000 births.	
Perak ... ..	...	...	...	...	...	2,474	...	151.98
Selangor ... ..	...	...	...	...	...	1,852	...	189.08
Negri Sembilan... ..	...	...	...	...	...	841	...	185.00
Pahang ... ..	...	...	...	...	...	796	...	185.68



*Deaths from Zymotic Diseases.*

State.	Plague.	Cholera.	Smallpox.	Cerebro-spinal meningitis.
Perak ... ..	—	...	1	...
Selangor ... ..	1	...	1	...
Negri Sembilan...	—	...	—	...
Pahang ... ..	—	...	—	...

*Death-rates (State figures for comparison).*

Year.	Perak.			Selangor.			Negri Sembilan.			Pahang.		
	Malaria.	Dysentery and diarrhoea.	Pulmonary tuberculosis.	Malaria.	Dysentery and diarrhoea.	Pulmonary tuberculosis.	Malaria.	Dysentery and diarrhoea.	Pulmonary tuberculosis.	Malaria.	Dysentery and diarrhoea.	Pulmonary tuberculosis.
1916 ... ..	15.26	1.91	2.40	13.57	4.03	1.44	16.53	3.58	1.00	12.26	1.12	1.03
1917 ... ..	15.81	2.58	2.25	12.75	4.38	1.47	18.81	4.26	2.80	14.00	1.30	1.14
* 1918 ... ..	Unreliable.			20.29	3.78	1.62	36.31	5.84	4.93	26.62	1.63	1.41
1919 ... ..	13.45	2.21	1.83	10.23	3.59	2.39	17.15	4.77	1.39	13.22	1.27	1.01
1920 ... ..	15.82	2.21	2.11	13.13	3.77	1.89	18.18	4.31	2.37	15.24	1.19	0.94
1921 ... ..	13.32	1.54	1.78	11.80	3.29	1.85	13.07	3.42	1.68	16.61	1.19	1.18
1922 ... ..	12.29	1.42	1.83	9.96	2.39	2.00	11.51	2.40	1.69	12.10	0.74	0.84

VITAL STATISTICS OF THE FOUR LARGE TOWNS, KUALA LUMPUR,  
IPOH, SEREMBAN AND TAIPING.

The population in each case is that within the Sanitary Board limits.

The crude death-rates are calculated on the total number of deaths within the Sanitary Board limits. The corrected death-rates are calculated on the total number of deaths within the Sanitary Board limits and including infants less than 30 days old but excluding the deaths of other persons who had been, at the date of death, resident for less than 30 days within Sanitary Board limits.

Town.	Estimated population.	Births.		Deaths of persons who previous to decease had resided in town one month.	
		No.	Rate per mille.	No.	Rate per mille.
Kuala Lumpur ... ..	84,476	1,813	21.46	1,803	21.36
Ipoh ... ..	38,895	974	25.04	847	21.78
Seremban ... ..	18,398	461	25.05	514	27.93
Taiping ... ..	21,296	721	33.86	747	35.08

*Table showing corrected deaths and death-rates during last seven years.*

Year.	Kuala Lumpur.		Ipoh.		Seremban.		Taiping.	
	Population.	Death-rate.	Population.	Death-rate.	Population.	Death-rate.	Population.	Death-rate.
1916 ... ..	61,443	27.73	29,915	30.15	11,397	52.55	22,237	36.00
1917 ... ..	63,064	28.45	31,032	32.67	13,620	55.35	22,859	31.00
1918 ... ..	64,686	38.34	32,150	35.92	14,082	81.66	23,481	41.61
1919 ... ..	66,308	26.36	33,238	23.56	14,544	45.38	24,721	37.45
1920 ... ..	67,930	30.00	34,357	22.64	15,006	34.05	25,434	39.90
1921 ... ..	81,197	27.02	37,194	20.38	17,479	36.16	21,178	50.05
1922 ... ..	84,476	21.36	38,895	21.78	18,398	27.93	21,296	35.08

\* Influenza year, figures probably very inaccurate.

*Table showing corrected deaths and death-rates for principal diseases.*

Town.	Malaria.		Dysentery and diarrhoea.		Pulmonary tuberculosis.		Beri-beri.	
	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.	Deaths.	Rate.
Kuala Lumpur	236	2.79	185	2.18	281	3.33	40	0.47
Ipoh ...	175	4.50	63	1.62	99	2.54	4	0.10
Seremban ...	192	10.44	109	5.92	117	6.35	44	2.39
Taiping ...	116	5.45	32	1.50	37	1.74	1	0.05

*Infantile Mortality Table.*

Town.				Births.	Deaths under one year.			Rate per 1,000 births.
Kuala Lumpur	...	...	1,813	...	339	...	186.43	
Ipoh	...	...	974	...	152	...	156.05	
Seremban	...	...	461	...	126	...	273.31	
Taiping	...	...	721	...	195	...	270.46	

*Table showing corrected death-rates in the four towns for the past six years.*

Year.			Kuala Lumpur.			Ipoh.			Seremban.			Taiping.		
			Malaria.	Dysentery and diarrhoea.	Pulmonary tuberculosis.	Malaria.	Dysentery and diarrhoea.	Pulmonary tuberculosis.	Malaria.	Dysentery and diarrhoea.	Pulmonary tuberculosis.	Malaria.	Dysentery and diarrhoea.	Pulmonary tuberculosis.
1917	...	...	4.65	3.47	3.23	11.98	2.70	3.67	22.33	8.00	1.47	11.16	3.79	3.62
1918	...	...	6.08	4.05	3.43	7.52	3.85	4.72	40.83	10.01	3.48	22.32	2.63	2.03
1919	...	...	4.69	3.35	3.24	6.32	5.35	3.09	19.18	7.70	3.71	16.78	3.52	2.42
1920	...	...	5.08	2.49	3.48	5.64	2.64	3.75	8.99	5.00	3.40	19.14	2.99	1.57
1921	...	...	5.25	3.63	3.22	11.24	2.39	4.54	11.76	16.71	6.23	25.06	6.06	3.95
1922	...	...	2.79	2.18	3.33	4.50	1.62	2.54	10.44	5.92	6.35	5.45	1.50	1.74

## ESTATE STATISTICS.

Returns were received from 1,297 estates. Besides these there are many small estates of less than 100 acres each which do not send returns. The 1,297 estates are distributed as follows :

Perak	...	...	{	Perak North	...	...	...	273	} = 620
				Kinta	...	...	...	127	
				Lower Perak	...	...	...	116	
				Batang Padang	...	...	...	104	
Selangor	...	...	{	Bernam	...	...	...	8	} = 372
				Coast	...	...	...	171	
				Kuala Lumpur, Selangor East,					
				Ulu Selangor and Ulu Langat	...			193	
Negri Sembilan	...	All districts	...	...	...	...	...	250	= 250
Pahang	...	..	...	...	...	...	...	55	= 55
									<hr/>
									1,297



Total number of labourers was 159,279.  
,, ,, Indian labourers was 125,569.

The distribution of labour was as follows :

			Indians.		Others.	Total.
Perak	...	...	Perak North ... ..	21,678	4,940	26,618
			Kinta ... ..	6,403	2,030	8,433
			Lower Perak and Batang Padang ... ..	21,864	2,584	24,448
Selangor	...	...	Bernam ... ..	1,869	—	1,869
			Kuala Lumpur, Ulu Selangor and Ulu Langat	16,387	4,538	20,925
			Coast ... ..	38,054	1,287	39,341
Negri Sembilan	...	...	All districts ... ..	17,254	14,396	31,650
Pahang	...	...	,, ... ..	2,060	3,935	5,995
Total, F.M.S.			...	125,569	33,710	159,279

The table below sets out the mortality rates among estate labourers during the past 12 years, that is, since the Health Branch took over the supervision of health condition on estates :

Year.	Total number of estate labourers.			Deaths.	Death-rate per mille.	
1911	...	...	143,614	9,040	...	62.9
1912	...	...	171,968	7,054	...	41.02
1913	...	...	182,937	5,592	...	29.6
1914	...	...	176,226	4,635	...	26.3
1915	...	...	169,100	2,839	...	16.78
1916	...	...	187,030	3,299	...	17.61
1917	...	...	214,972	3,906	...	18.71
*1918	...	...	213,425	9,081	...	42.55
1919	...	...	216,573	3,384	...	15.16
1920	...	...	235,156	4,367	...	18.57
1921	...	...	175,649	3,195	...	18.19
1922	...	...	159,279	2,556	...	16.05

There were 2,240 deaths among the 125,569 Indian estate labourers during the year, giving a mortality rate of 17.84 per mille.

Divisions.	Malaria admissions to estate and Govt. hospitals.	Malarial deaths in estate and Govt. hospitals.	Total admissions to estate and Govt. hospitals.	Total labourers employed, all nationalities.	Total deaths.	Death-rate per mille.	Indians employed.	Deaths, Indian labour force.	Death-rates, Indian labour force.	Number of estates.	Number of estate hospitals.
Selangor East ...	4,727	145	10,599	20,925	426	20.35	16,387	410	25.01	193	22
Coast, Selangor	5,652	212	13,846	39,341	571	14.51	38,054	558	14.66	181	34
Pahang ... ..	1,818	37	5,064	5,995	175	29.19	2,060	60	29.12	55	8
Negri Sembilan	6,557	147	15,980	31,650	561	17.72	17,254	464	26.89	250	44
Perak North ...	2,541	102	9,522	26,618	367	13.79	21,678	357	16.47	273	25
Kinta ... ..	1,586	39	3,247	8,433	153	18.14	6,403	106	16.55	126	6
Lower Perak ...	3,828	113	10,677	24,448	286	10.70	21,864	268	12.26	220	25
Bernam ... ..	86	...	600	1,869	17	9.09	1,869	17	9.09	8	2
Total ...	26,795	795	69,535	159,279	2,556	16.05	125,569	2,240	17.84	1,306	166

\* Influenza year.

A. R. WELLINGTON,  
Senior Health Officer, F.M.S.

ANNUAL REPORT OF THE CENTRAL MENTAL HOSPITAL, TANJONG  
RAMBUTAN, FOR THE YEAR 1922.

CENTRAL MENTAL HOSPITAL,  
*Tanjong Rambutan, 27th January, 1923.*

Sir,—I have the honour to forward herewith the twelfth annual report of the Central Mental Hospital, Tanjong Rambutan, that for the year 1922.

	Males.	Females.	Total.	
2. There remained on 31st December, 1921...	767	201	968	
Admitted during 1922 ... ..	383	91	474	
Discharged { (a) recovered ... ..	161	43	204	
(b) relieved ... ..	16	10	26	
(c) not improved ... ..	8	2	10	
(d) not insane ... ..	4	—	4	
Absconded ... ..	47	—	47	
Died ... ..	76	25	101	
Remaining on 31st December, 1922 ...	838	212	1,050	1,050
In addition there were Singapore patients—				
Remained on 31st December, 1921 ...	111	79	190	
Admitted during 1922 ... ..	39	15	54	
Discharged ... ..	1	1	2	
Absconded ... ..	2	—	2	
Died ... ..	5	6	11	
Remaining on 31st December, 1922 ...	142	87	229	229
Johore patients—				
Remained on 31st December, 1921 ...	39	8	47	
Discharged ... ..	2	—	2	
Died ... ..	3	—	3	
Transferred ... ..	34	8	42	
Remaining on 31st December, 1922 ...	—	—	—	—
Criminals—				
Remained on 31st December, 1921 ...	56	2	58	
Admitted during 1922 ... ..	22	—	22	
Discharged ... ..	8	—	8	
Absconded ... ..	1	—	1	
Died ... ..	4	—	4	
Remaining on 31st December, 1922 ...	65	2	67	67
Kedah patients—				
Remained on 31st December, 1921 ...	42	8	50	
Admitted during 1922 ... ..	46	8	54	
Discharged ... ..	8	3	11	
Absconded ... ..	4	—	4	
Died ... ..	5	—	5	
Remaining on 31st December, 1922 ...	71	13	84	84
Total remaining on 31st December, 1922 ...	1,116	314	1,430	1,430
Percentage of recoveries ... ..	42.04	per cent.		
„ deaths on total treated	6.47	„		
„ „ daily average	8.89	„		

An increase of 117 against 189 last year, and 104 in 1920.

3. This would have been far greater had it not been that the Johore patients, 42 in number, were removed during the year. Against this however we had 34 more Singapore admissions. As regards Federated Malay States patients, with whom most of my remarks in the following report will deal, the increase was 82 against 133 last year and 104 the year before. The smaller increase is due to a smaller admission and a greater number of discharges 244 against 194 in the case of the latter.

4. *Admissions.*—The total admissions for the year was 604 but the only ones I propose to analyse are those from the Federated Malay States.

The number was 474 which is 22 less than last year but 68 more than in 1920.



5. The same causes operated during 1922 as in 1921 and these tend to keep up the high admission rate. As to the form of disease on admission we again find recent mania at the head of the list with 112 cases. Recent melancholia with 102 comes second. Confusional insanity comes third with 73 and primary dementia fourth with 52. General paralysis of the insane appears 27 times against 22 in 1921 and 18 in 1920 showing a steady increase in each of the last three years. The chief forms showed the same position in the table as last year though the first two showed a considerable reduction in number 112 and 102 against 130 and 121 respectively.

6. Confusional insanity was about the same but primary dementia increased from 46 to 52. Only six one may say, but the total admissions were less so one would hope to see a slight reduction in the disease and not an increase.

7. The increase, even though slight, in primary dementia is serious, as it is a disease which attacks the young adult or adolescent, and always leaves a certain amount of damage behind it, with a very considerable chance of a recurrence later in life, perhaps within a very few years, with the probability of ending as a permanent inmate of a mental hospital. Some authorities go so far, in fact, as to say that there is no such thing as a recovery in a case of primary dementia.

8. Amongst the admissions were a number of readmissions due principally to the fact that discharged patients found it hard to get work unless their old employers were willing to have them back, or they had relations or friends to go to.

9. The failure to find work meant a strain they were unfit to stand, and in many cases actual starvation. Unfortunately there is no place to send these people and it is a great question if it would not be better to keep them here rather than send them out to face a hard world, having only just recovered from a serious illness. Several patients failing to find work came back again, and at their request were readmitted. I was able in some cases to employ them as grass-cutters or on some such work.

10. *Discharges.*—The discharges number 244 against 194 last year. There is an increase under each head, "Recovered", "Relieved", "Not Improved", and "Not Insane". As regards "Relieved" I discharged 23 against 8 the previous year. By keeping some of these cases a short time longer I could have returned them as "Recoveries", and improved the recovery-rate; but I was satisfied that they could complete their recovery quite as well at home as here, and as their friends wanted to have them home I allowed them to go. One advantage of this course is that it tends more to the general hospital idea, and will show relations of patients that there is no wish to keep their people longer than is necessary. It will also tend to give confidence to those whose relatives needs treatment, and help to persuade them to seek such aid earlier, and thus increase the chance of recovery.

11. As to the "Recoveries" they number 207 against 177 last year, giving a recovery-rate of 42.04 against 35.68 for last year and 40.39 in 1920. The diseases on admission of the recovery (Table III) shows 79 cases of recent mania against 62 last year, 47 against 49 cases of recent melancholia. Confusional insanity and primary dementia are exactly the same with 26 and 12 respectively. The order is the same as last year.

12. *Aetiology.*—(Table IV). The great increase in the figures given will at once be noticed. This is due, in part, to the fact that, as I pointed out last year, the figure did not cover the whole year, but also that the records have been more carefully kept, and relatives appear more willing to give information; not that the information was always of great value. On the whole, however, the information supplied was very useful.

13. It will be noticed that intestinal trouble has ousted malaria from the top of the list. It must be remembered that this system is an extensive one and consists of many parts open to trouble. Though intestinal parasites had a distinct bearing on several of the cases the fact that, although 219 patients or 46 per cent. had intestinal parasites on admission, only 101 cases altogether could be returned as having a gastero-intestinal origin, suggesting that they are not of such great importance as I once thought.

14. The predominance of this system as a cause bears out the contention of Ford Robertson, and his attacking and treatment of certain cases of mental disease from this stand point.

15. It also, to my mind, supports the theory propounded some 15 or 20 years ago by Lewis Bruce.

16. Bracketed second we find malaria and "Haemopoietic system". For long malaria has appeared at the head of the aetiological table and needs no comment save to emphasize the scourge malaria is to the tropical dweller. One may however take comfort from the fact that although there must have been tens of thousands of cases of malaria in the country only 78 gave rise even indirectly to mental trouble.



17. That the "Haemopoietic system" should have sprung into prominence this year is due to the fact that blood examinations have been carried out more thoroughly and systematically, due to the fact that our staff is larger and more experienced.

18. Of course in the majority of cases, this cause depends on the two previous ones, namely, malaria and intestinal parasites.

19. Alcohol comes next with 64 appearances. I last year pointed out how serious a matter this is becoming, especially in the case of the Chinese, who formerly were the most sober of people.

20. I have gone further into the subject this year and have noticed the nationalities of the alcoholic cases and found 37 cases are Chinese, 26 Tamils and 1 Siamese. How many times had one heard the Tamils described as drunkards? Yet here we find that when it comes to admission to a mental hospital, alcohol is the cause almost as frequently in the Chinese as the Tamils.

Why is it?

21. The Chinese are taking to spirit as a substitute for opium, which he is being persuaded is a deadly poison. I fear that the spirit that many Chinese consume is a much more deadly poison.

Compare these two as a cause amongst our admissions—alcohol 37, opium 2—and neither of these two cases showed deprivation symptoms.

22. Syphilis appears 35 times having fallen below alcohol as a cause.

23. Wassermann examinations were only done in selected cases as, unfortunately, the Government Laboratories are unable to do the examination on all cases admitted.

24. I hope the day will come when we shall have a small laboratory of our own, and do this and other work, including the preparation of vaccines, etc. We have still to go a long way however before we can hope for this.

25. Puberty and adolescence appears 38 times, principally in cases of primary dementia.

26. Mental stress appears 41 times, 5 times under the heading "Sudden" and 36 times as "Prolonged".

27. Privation and starvation appears 17 times, and as both these causes were principally due to the slump one can see the effect of the bad times on the mental side.

These two causes should practically disappear when times improve again, but let us hope with the return of prosperity, when people will have more money to spend, that, to make up for the reduction in these causes, we do not have an increase in alcohol and syphilis as causes.

28. Cardiovascular degeneration appears 21 times, and it may be pointed out that in many cases syphilis and alcohol are the causes of the trouble.

29. I have now touched on the principal causes as shown by the figures collected for 1922, and there is little more to be said save that in the cases of the three most frequent causes it is, save malaria, almost invariable as a contributory cause, and in the case of malaria more than twice as often shown as a contributory cause; whereas alcohol and syphilis appear more frequently as primary causes.

Heredity is shown as a cause in 11 cases. In one way this is a satisfaction to me. Not that I want to see heredity appearing as a cause but, knowing that it undoubtedly is a cause in many cases, particularly those of primary dementia, I am glad to see that people have advanced so far as to acknowledge it. For years we have had cases admitted that undoubtedly had a bad heredity behind them but the fact was always denied. I attribute the increase in the appearance of heredity in the etiological table to the fact that people are at last coming to realize that mental disease is not a crime to be ashamed of, but a genuine disease. If people can be educated up to this I shall feel that I have not lived in Malaya in vain.

30. *Deaths*.—The death-rate works out on total number treated at 6.47 per cent. and on daily average at 8.89 per cent.

This is the lowest death-rate we have ever had.

31. Without seeing the general death-rate I cannot of course say whether this is not merely due to a generally more healthy year or not, but I am inclined to think that it is to some extent due to the fact that we have had a fuller staff than we have had for years, that isolation of dysentery and phthisis is bearing fruit, and to the fact that every patient admitted with intestinal parasites is taken in hand and treated before being passed to the general wards. Any patient with intestinal parasites leaving the acute ward (Conolly Norman) goes to No. XI where he remains until he is clear of his trouble.



32. Turning to the principal causes of death we find that whereas dysentery and malaria were head of the list last year with 31 and 29 respectively, we find phthisis and general paralysis of the insane bracketed together first with dysentery and malaria third and fourth. Even though phthisis is at the top of the list it only appears 21 times against 25 last year. General paralysis of the insane appears 21 times against 20 last year.

33. In the case of dysentery it has dropped from 31 appearances to 16 and malaria from 29 to 12. I should like to claim this as being due to careful isolation and anti-malarial works, but, though I think these steps have something to do with the improvement, I would not like to claim all the credit for the work that has been done, as we must carry on our work over a period of years before it would be safe to make extravagant claims.

34. General paralysis of the insane, phthisis, dysentery and malaria are the only causes of deaths which show double figures.

35. *Suicide*.—I am glad to say that we had no suicide.

36. *Fatalities*.—We had four sudden deaths—three due to ruptured spleens and one due to a ruptured intestine.

37. In the case of the ruptured intestine and two of the cases of ruptured spleen the patient was kicked by a fellow patient. These occurrences are regrettable, but I fear unavoidable because patients will quarrel, and enlarged spleens are common, many of them only waiting for the slightest provocation to rupture.

38. In the third case of ruptured spleen nothing was known. The man was found collapsed one morning with symptoms suggesting a ruptured spleen. He was operated upon and a ruptured spleen was found but the patient died. There was no history whatever of violence. There was no extravasation of blood into the sounding tissues. He had a very much enlarged spleen and subtertian parasites had been found in the blood the day before. On the whole the case appeared to be one of spontaneous rupture.

39. There was another fatality. In this case it was a patient who killed an attendant.

The attendant was one of a party of four, under a young Bengali Brahmin attendant, reaping ragi. There was another party about 400 yards away, the attendant in charge of which hearing a shout looked up and saw the young attendant running, pursued by one of the patients. After running about 40 yards the unfortunate lad collapsed, and by the time the other attendant reached him he was dead. It was then found that he had been stabbed in the root of the neck evidently by the patient who was in a very excited state. He was threatening in his manner and it was not until Dr. Stone, the Assistant Medical Superintendent, who was in the dysentery ward at the time, arrived that the man could be disarmed. This patient had been working outside for seven years, and had always been a good worker and well behaved. It is hard to say what happened. A partially peeled papaya was found at the spot where the attendant was stabbed, and my theory is that the attendant, not noticing what was going on, had allowed the patient to wander away to where some papayas were growing and help himself. The patient then apparently returned and sat down to enjoy his papaya. The attendant noticing what had happened abused the patient, who attacked and stabbed him. This is merely conjecture as no explanation or hint of what happened has been got from the patient since.

40. Unfortunately it is difficult to persuade new attendants that tact or persuasion can get almost anything from the majority of patients. Many attendants after a fair trial have to be got rid of on this account.

41. *Absconding*.—Again the number is high—47. Though many of the cases were brought back or recertified and readmitted quite a number never came back.

Some of them were improving and would have been discharged at a fairly early date, and probably succeeded in getting work. Some came back of their own accord evidently finding that it was better to get food, lodging and clothing in the Central Mental Hospital than starve outside.

43. One escape was that of a clerk from a Government office, who had improved sufficiently to be tried at work in the office with a view to discharge. Ten days after his escape I got a letter from his wife asking me to take him back, as he could not be allowed to resume work without a certificate from me. He came back and after about a month or so, returned to work, and, I am glad to say, according to a report I had of him quite lately, is doing well.

44. Of the 200 or so patients working in the farms, cowsheds, etc., who could walk away anytime they like, very few escape though they sometimes wander off to the town "on their own" for an hour or so.



45. *Criminals.*—There were 22 admissions against 26 last year and 14 in 1920. Some had become insane while undergoing their sentence, some had been found guilty but insane, while others were sent under observation pending trial. Of the latter, three, all murderers, were not insane and were at their trial found guilty and condemned to death. It appears to me the plea of insanity is becoming rather too common in serious cases, and is a plea that is likely to be abused and in fact has been.

46. Of those who were actually insane the types of mental disease were much the same as in the ordinary cases. One of the criminals is shown as having escaped but he was a short-sentence prisoner who was out of his term, and was not in the criminal ward. In fact he should not have been sent in as a criminal at all.

47. *Singapore.*—The Singapore patients were the usual chronics and dements. Fifty-four were admitted against 20 last year; this was due to the fact that owing to the removal of the Johore patients we had some room to spare and were able to relieve the congestion in Singapore by admitting some extra patients.

48. *Johore.*—The Johore patients were removed in September as Johore has provided its own accommodation.

49. *Kedah.*—There were 54 admissions from Kedah which exceeded the number we started the year with by 4. This exceeds the number admitted from March 1st, 1921, to December 31st, 1921, excluding the original batch of 41 by 36. It is in fact more than double the numbers.

50. I hope this does not mean that there is an increase in mental diseases to this extent. It cannot be; but is probably due to the same cause that made people say years ago that the opening of an asylum meant an increase of insanity. It is partly due to the fact that patients who have been more or less looked after for years are sent along to hospital, and other patients who formerly wandered about—the village idiot type—are bundled off as soon as there is some place to keep them, and the relations have satisfied themselves that they will be properly looked after.

51. *New Buildings.*—No new wards were under construction during the year and even work which should have been put in hand had to be put off for better times.

52. *Work.*—I attach a list of work done during the year and a valuation of it. The valuation of the building work, road making, etc., was kindly done for me by the Public Works Department building overseer.

53. Though, I put in, as usual, the value of the work done it must be remembered that the work cannot be valued in mere dollars and cents, as the true value of the work can only be gaged by the benefit it is to the patient engaged in it.

54. As usual all the patients' and attendants' clothing was made in the work rooms, the larger proportion of the former being made in the female side.

55. One has only to look at a few of the items to see the immense amount of work done, for instance, 3,200 brooms made, 3,854 bajus and trousers mended, and the latter only on the male side.

56. *Farms.*—The farms were again a success, though the total value of the products is only about \$650 more than last year. This is due in most cases, to a reduction in prices—for instance, though we supplied 213,271.6 katis of vegetable against 191,015 last year the value is only \$21,446.05 against \$22,604.65 last year.

57. We supplied 22,217 pints of milk against 14,762 last year. Pork is about the only article which shows any decrease in quantity, and that should be more than made up for this year as the pigs are increasing in number, and improving steadily. We imported two Manilla boars, which the Agricultural Department kindly arranged for us. We sold a few cows and a young bull and exchanged one of our young bullocks for a pure bred Australian cow from the Hill. This last was a risk, but I hope it will turn out all right.

58. The sheep can only be written down as a hopeless failure. What the trouble is I don't know. The Veterinary Department has done its best and must be tired to death of our sheep. I have searched for a remedy, but still they died, one would think from sheer contrariness.

59. The fruit farm is being steadily extended and improved and in a few years time should produce a unique supply of fruit both in quantity and variety. I should like to express my gratitude to the Agricultural Department for the valuable assistance and advice given me.

60. *Staff.*—The staff has been more satisfactory than for years. The old permanent members who have an interest, and take a pride in the place of course worked with all their energy and loyalty; but for the first year, I think I may say,



I found this pride and sense of esprit de corps displayed by several of the temporary members of the staff. Some of them could with advantage be made permanent. We only had one storekeeper during the year which is a great advantage and a marked improvement over the three we have sometimes had. Mr. De Silva came here as storekeeper at the beginning of the year and remained for the whole year. Mr. Christie was appointed as clerk on 1st January, 1922, and Mr. Hendricks relieved Mr. Kandiah as Chief Clerk in August.

61. For the second half of the year we had a full assistant surgeon staff when Mr. Murugiah came direct from the school. I must say I prefer this arrangement with regard to assistant surgeons.

62. Two dressers Mr. Ooi Cheng Yean and Mr. Nagaratnam passed the final examination for the Medico Psychology Nursing Certificate and now have the certificates and badges. Mr. Thambiah passed the Preliminary. Mrs. Josephs, the Matron, went on leave in December, and Nurse Sut Prem Kaur is acting for her.

63. The attendant staff has been much as usual, a great trial and few satisfactory ones have been added to the number of reliable attendants who make their work a life work.

64. There were few changes amongst the head attendants save that the female night head attendant retired and was relieved by charge attendant Veeramah and a vacancy in the assistant head attendants' list was filled by the promotion of charge attendant Sahadeo.

65. *Maintenance Rate.*—The maintenance rate works out at \$182.14 per head against \$223.41 last year and \$293.73 in 1920. This is to a great extent due to a fall in prices, but is also due to the large amount of food-stuff supplied by the hospital and an increased supply of rice substitutes like millet, peas, beans, Indian corn, etc. Many of the patients have got very fond of soups made of peas, beans, etc., with some extra potatoes or tapioca to make up the filling qualities of rice.

66. *General.*—Under this head I place the most important happening of the year. I refer to the passing of the Mental Disorders Enactment which passed the Federal Council in November. It has taken many years to get this measure accepted and passed, but now that it has at last gone through I hope it will prove as beneficial as it was meant to be. It should make a great difference in enabling patients to come under treatment early, and more easily, and, if they themselves wish, to come as voluntary boarders. Patients many times have come and asked to be taken in. I have done so, but have thereby broken the law, and left myself open to prosecution. Now I can admit these people without any fear, or a qualm of conscience.

67. Again I have hopes that the removal of the word "lunatic" will help to show patients relations and friends, and the patients themselves that they were not outcasts little better than criminals of the worst type, but are actually sick people.

68. It is with a great deal of satisfaction that I can date this report from the Central Mental Hospital. I hope the Honourable the Chief Secretary will not object to my thanking him for the help he has given me in this. In fact I can say that were it not for the interest he took in the subject the law would never have been amended.

69. Anti-malarial work took up a great deal of our energies. We laid 8,000 feet of subsoil pipes, all of which we made ourselves but much still remains to be done.

70. We are carrying out a big scheme on the Sungei Bulat for the completion of which we must wait before we can satisfactorily tackle some of the most important pieces of work. The scheme is to straighten out the stream between our boundary and the Ipoh-Tanjong Rambutan railway line, and then slope and sod the banks, to as far as possible prevent wash. Later as funds become available I intend to lay concrete inverts along its whole length through our reserve and to within two chains of the railway—about 2,000 yards. The first thing to be done was to obtain the permission of the managers and owners of Chemor United, Chettiappa and Tanjong Rambutan estates to cut a big drain, or rather recut the bed of the stream, through their properties. They not only consented, but gave me permission to cut out a certain number of rubber trees which stood in the course, or would interfere with the sloping of the banks. I have completed the straightening of the stream to within two chains of the railway culvert. This I was told was enough by the Executive Engineer, Anti-Malarial Board, who kindly came to see the work for me. We have also deepened, sloped and sodded the banks of 430 yards of it, and this brings us within about 100 yards of our own boundary. We would have done a great deal more had it not been for the extremely heavy rain in November and December which washed out our new cuttings before we had time to slope and turf. Eventually I had to stop deepening and content myself with completing the sloping and sodding to where we had stopped cutting.



71. As soon as the dry weather sets in I hope to recommence deepening and by the end of next year hope to have more or less complete this part of the work, though the complete work will take probably two years more.

72. When the whole stream has been deepened I can put in subsoil pipes in all the subsidiary drains and make the place as near to being dry on the surface as it is possible to get any place.

73. The work on the Sungei Bulat is the key to drying the whole reserve.

74. That the work as far as it has gone has had some effect is being borne out by the figures for malaria which are as follows: deaths 12; total cases 167, giving a daily average of .46 per cent.; number of individuals 139, giving a daily average of .38 per cent. When it is remembered that comparatively few patients can be allowed mosquito nets for reasons of observation, and that many came in soaked with fever I think the above figures may be looked upon as most satisfactory. With regard to attendants the daily average sick works out at .2 per cent. and again we got many fever soaked subjects.

75. Seeing that one has to be chary of the use of nets the importance of a war on mosquitoes, both anopheline and other, is greatly enhanced. I cannot close this section without thanking the Health Officer, Ipoh, and the Executive Engineer, Anti-Malarial Board, Taiping, for their kind interest in the work, and their valuable advices which have been freely given.

76. I have continued my policy of isolating all cases of pulmonary tuberculosis, dysentery, and also all skin diseases, all cases suffering from intestinal parasites are put in a separate ward and kept there until they are cured.

77. When it is pointed out that nearly 50 per cent. of all cases admitted suffered from ascariasis or ankylostomiasis the importance of such a policy can be seen. Though ankylostomiasis rarely causes death it reduces the resistance to other diseases and the person's ability to work or to enjoy life.

78. With regards to the number of the different nationalities admitted a glance at Table (II) will show that considerably more than half the total admissions were Chinese who were nearly twice as numerous as the Tamils, who in turn were between three or four times as numerous as the Malays.

79. A remarkable fact with regards to the disease from which the different nationalities suffered was that of the 27 cases of general paralysis of the insane admitted 25 were Chinese, and 2 Japanese. In all my years here there have been extremely few cases of Tamils, Malays, or Javanese suffering from general paralysis of the insane. I can at this moment recall only two of each. The Tamils appear slightly more prone proportionately to mania and melancholia and vastly more prone to confusional insanity due probably to the number of Tamils admitted from unhealthy districts whose trouble was in part or wholly due to malaria. This also holds good in the case of Malays who showed a proportion of roughly 1 to  $6\frac{1}{2}$  on admission and exactly 1 to 4 in cases of confusional insanity admitted.

80. *Amusements.*—Drafts, chess, cards, dominoes, etc., were played in the wards by the patients. The Sunday walks round the grounds, or to the town according to the class of case, were carried out as usual and advantage was taken of travelling cinemas to take those patients who were fit for it. The sports were held in July, and favoured by fine weather, went off as well as usual, providing a day's amusement for patients and attendants alike. Football and cricket were both played and in both teams places were found where possible for patients, some of the regular members of the football team being patients.

81. The cricket team had quite a good year winning most of its matches, but the football team had only a fair season.

82. May I in closing my report express my thanks to Government for the support which has again been extended to me without which it would be impossible to carry on.

I have the honour to be.

Sir,

Your obedient servant,

TANJONG RAMBUTAN,  
27th January, 1923.

W. F. SAMUELS,  
Medical Superintendent,  
Central Mental Hospital, Tanjong Rambutan, F.M.S.



*Buildings during 1922.—*

Erecting temporary ward in female D. ward	...	...	...	...	1
„ new shed and paddock for the bull in Richmond Farm	...	...	...	...	1
„ new shed for cooking cattle food	...	...	...	...	1
„ „ keeping grass	...	...	...	...	1
„ „ the calves	...	...	...	...	1
Converting old pig sty into cowshed in Richmond Farm	...	...	...	...	1
Concrete tanks at back of pig sty in Portrane Farm	...	...	...	...	2

*Repairing.—*

Rethatching lalang roof and general repairs to Highfield Farm	...	...	...	...	1
„ „ to buffaloes shed at Highfield Farm	...	...	...	...	1
„ roof to sheep house	...	...	...	...	1
Bathing tank stand and new outlet	...	...	...	...	1
„ tanks at Woodside Farm	...	...	...	...	1

*Bridges.—*

Building a new bridge across the stream at back of Woodside	...	...	...	1
New bridge across the stream at back of Portrane Farm	...	...	...	1

*Repairing.—*

Repairing brick pillars and plastering work to bridge in acute ward road	...	...	...	...	1
Reconstruction of bridge near Highfield Farm	...	...	...	...	1
Bridge by Woodside Farm No. 1	...	...	...	...	1
„ „ „ 2	...	...	...	...	1

*Drains.—*

Excavating and fixing subsoil pipe and filling round Portrane Farm	3,005 feet long.
„ from the dale at back of acute ward to the cement drain	700 feet long.
„ „ back of D. ward to the concrete drain	491 feet long.
„ in the Park	168 feet long.
„ along the road to Horton Farm	153 feet long.
„ on the slope of Horton Farm	375 feet long.
„ from the back of dysentery ward to the cement drain across the front of Horton Farm	600 feet long.
„ from burial ground to main drain across pipe line	700 feet.
„ „ back of No. 6 ward to Richmond Farm	1,304 feet long and to adjoining subsoil drains measuring 1,060 feet.
„ fixing pipe and filling seven short drains along the cement drain in Richmond Farm,	total 125 feet.
Sloping and turfing drain from No. 6 ward to the cement drain	400 feet.
„ „ „ boundary near Farm 2 to Chettiappa's estate,	1,160 feet.
„ and turfing drain at back of clerks' quarters	265 feet long.
„ „ „ Woodside Farm	100 feet long.

*Bamboo Works.—*

Bamboo brooms	...	...	...	3,200 at \$0.22 each	= \$704.00
Baskets, earth carrying	...	...	...	618 „ 0.45 „	= 278.16
Bamboo sunhats	...	...	...	513 „ 0.60 „	= 307.80
Baskets, rice washing	...	...	...	24 „ 1.25 „	= 30.00
„ carrying vegetables	...	...	...	19 „ 1.00 „	= 19.00
„ attendants' rations	...	...	...	81 „ 0.15 „	= 12.15
„ carrying grass	...	...	...	28 „ 0.50 „	= 14.00
„ boiling fish	...	...	...	12 „ 0.90 „	= 10.80
Repairing baskets	...	...	...	352 „ 0.05 „	= 17.60

*Tailoring.*—

Patients' bajus	...	...	...	...	497	at	\$0.13	each	=	\$ 64.61
Attendants' short pants	...	...	...	...	357	,,	0.50	,,	=	178.50
,, shirts	...	...	...	...	331	,,	0.70	,,	=	231.70
Patients' trousers	...	...	...	...	440	,,	0.12	,,	=	52.80
Canvas stretcher for camp bed	...	...	...	...	11	,,	1.25	,,	=	13.75
Coats, attendants	...	...	...	...	4	,,	0.80	,,	=	3.20
Pants	...	...	...	...	4	,,	0.60	,,	=	2.40
Long coats, American drill...	...	...	...	...	2	,,	0.75	,,	=	1.50

*Mending.*—

Patients' bajus and trousers	...	...	3,854	„	0.05	„	=	192.70
Canvas suits	...	...	3	„	0.40	„	=	1.20
Attendants' uniforms	...	...	185	„	0.20	„	=	37.00

*Carpentering.*—

Coffins	...	...	...	...	...	141	„	0.60	„	=	84.60
New food trollies	...	...	...	...	...	7	„	9.00	„	=	63.00
Shelves for female ward	...	...	...	...	...	2	„	3.00	„	=	6.00
Wooden box to keep sand in wards	...	...	...	...	...	77	„	0.10	„	=	7.70
Feeding trays for sheep	...	...	...	...	...	4	„	0.25	„	=	1.00
Almeirah for dispensary	...	...	...	...	...	1	„	3.00	„	=	3.00
Basin stand	...	...	...	...	...	1	„	1.00	„	=	1.00
Writing table, small	...	...	...	...	...	1	„	2.50	„	=	2.50
„ with 14 drawers	...	...	...	...	...	1	„	11.00	„	=	11.00
Rice carrying trays	...	...	...	...	...	6	„	7.00	„	=	42.00
Sledges (buffalo)	...	...	...	...	...	2	„	8.00	„	=	16.00
Curry pounder	...	...	...	...	...	1	„	2.00	„	=	2.00
Shelves for supporting tea wires	...	...	...	...	...	25	„	0.80	„	=	20.00
Wooden moulds for clay pipe making	...	...	...	...	...	10	„	2.00	„	=	20.00
Feeding trays for pigs	...	...	...	...	...	7	„	0.25	„	=	1.75
Hand cart for carrying moving machine...	...	...	...	...	...	1	„	3.50	„	=	3.50
Paper trays	...	...	...	...	...	6	„	0.50	„	=	3.00
Bathing buckets (wooden)	...	...	...	...	...	55	„	0.25	„	=	18.75
Cover wooden for generator	...	...	...	...	...	2	„	1.00	„	=	2.00
Pan covers	...	...	...	...	...	10	„	0.25	„	=	2.50
Inventory boards	...	...	...	...	...	22	„	0.25	„	=	5.50

*Repairing.*—

Food trollies ...	...	...	...	...	38	„	3.00	„	=	114.00
Dining tables	...	...	...	...	13	„	3.00	„	=	39.00
Wooden benches	...	...	...	...	121	„	1.00	„	=	121.00
Bed boards ...	...	...	...	...	36	„	1.00	„	=	36.00
Buffalo sledges	...	...	...	...	9	„	5.00	„	=	45.00
Screens ...	...	...	...	...	2	„	1.50	„	=	3.00
Towel racks ...	...	...	...	...	2	„	1.00	„	=	2.00
Wooden buckets	...	...	...	...	28	„	0.25	„	=	7.00
Almeirah for keeping bowls	...	...	...	...	1	„	1.50	„	=	1.50
Commode ...	...	...	...	...	1	„	1.00	„	=	1.00
Bullock carts	...	...	...	...	15	„	10.00	„	=	150.00

*Tin Smith.*—

Tin boxes to keep dressings in wards	...	10	„	0.50	„	=	5.00
Tin bowls	...	...	...	120	„	0.35	„ = 42.00

*Repairing.*—

Hurricane lamps	...	...	...	...	120	„	0.10	„	=	12.00
Bowls repairing	...	...	...	...	80	„	0.15	„	=	12.00
Tin mugs repairing	...	...	...	...	28	„	0.05	„	=	1.40

*Miscellaneous.*—

Coir brooms ... ..	15	„	0.22	„	=	3.30
Concrete tomb stones .....	99	„	0.25	„	=	24.75
Open new road from Woodside to Portrane 1.						



*Daily Works.*—

Laying out, weeding and clearing land for planting food-stuff.	
Drain clearing and scavenging.	
Sweeping and clearing grass under the shade trees.	
Carting firewood and rubbish.	
Gardening.	
Repairing and planting bamboo fence.	
Clearing roads and weeding in fields.	
Boundary clearing.	
Scything.	
Clearing overgrown on side of drains.	
Fillings and levelling up holes and swamps.	
Collecting fuel in the jungle for the kiln.	
Spraying oil to swamps.	
Clay pipes making (9,000; 6" pipes; 2,500, 4" pipes; 1,000, 2" pipes; 6" at 10 cents, 4" at 8 cents, 2" at 6 cents ... .. =	\$1,160.00
Firewood supplied to kitchen, 18,452 katis ... ..	92.26
7,608 katis " engine room and dysentery wards, ... ..	35.04
Total ...	\$4,396.86

## ABSTRACT, 1922.

Temporary ward in D. ward building newly ... ..	\$ 380.51
Shed for cooking cowsfood ... ..	35.58
Grass shed ... ..	33.17
Repairing bathing tank and stand and new outlet ... ..	77.60
Rethatching goat sheds ... ..	46.64
Shed for calves ... ..	52.06
Rethatching buffaloes sheds ... ..	23.06
" Highfield Farm ... ..	54.22
Sloping and deepening Sungei Bulat Ravine ... ..	150.50
Excavating trenches round Portrane Farm, fixing pipe and filling ...	1,254.50
Portrane Farm ... ..	111.60
Repairing bridge, Portrane Farm ... ..	39.00
Leigh Farm ... ..	84.00
Richmond Farm paddock and shed ... ..	126.01
Repairing bridge at Farm No. 6, Houlton ... ..	13.00
Woodside repairing bathing tank and kitchen sink ... ..	43.77
Repairing bridge by Woodside Farm No. 1 ... ..	34.00
" " " " No. 2 ... ..	23.00
Sloping off and turfing drain at back of Woodside Farm ... ..	29.00
New road from Woodside to Portrane Farm ... ..	77.80
Repairing bridge of acute ward road ... ..	7.20
Sloping off and turfing drain between Gravel and main road ...	75.40
Excavation, fixing subsoil drain pipes and filling ... ..	1,163.50
Total ...	\$3,935.12

## FARM PRODUCE DURING 1922.

Milk, fresh ... ..	22,217½ pints	\$ 4,714.34
Pork ... ..	3,643.4 ths.	1,675.78
Mutton ... ..	228.8	169.10
Chicken cleaned ... ..	139.10	95.22
Eggs, hen ... ..	1,899	67.35
Curry stuffs ... ..	1,343.00	324.79
Rice white ground ... ..	3.00	.15
Arrow-root ... ..	46.4	30.83
Flour tapioca ... ..	697.10	90.69
Onion ... ..	101.15	12.23
Yam ... ..	10,790.6	3,287.66
Potatoes ... ..	6.2	.80
Sweet potatoes ... ..	12,261.00	455.33
" for pigs ... ..	1,520.00	30.40

## FARM PRODUCE DURING 1922—(cont.)

Total ... \$35,255.14

## SEWING WORK DONE BY WORK MISTRESS DURING 1922.

\$1,528.25

*Mendings.*—

Total ... \$1,737.27



I.

General table showing the movement of the Asylum population during the year 1922.

—	M.	F.	T.	M.	F.	T.
On the Asylum Register, 1st January, 1922 ...	1,015	298	1,313			
Total cases admitted during the year ...	490	114	604			
Total cases under treatment during the year ...	1,505	412	1,917			
Cases discharged or transferred during the year—						
Recovered ... ..	...	...	...	161	46	207
Relieved ... ..	...	...	...	16	7	23
Not improved ... ..	...	...	...	8	2	10
Died during the year ... ..	...	...	...	76	25	101
Not insane ... ..	...	...	...	4	0	4
Total cases absconded, discharged, and died during year ... ..	...	...	...	265	80	345
On the Asylum Register, 31st December, 1922...	1,116	314	1,430			
Average daily number of the Register during the year ... ..	...	1,393.81				

Certified persons (i.e., separate persons in the contradiction to “cases” which may include the same individual more than once).....

	M.	F.	T.
Certified under care during the year ...			
„ admitted ... ..			
„ received ... ..			

## II.

Table showing the form of mental disorder on admission in the direct admissions and transfers during the year 1922.

Forms of mental disorder.	Direct Admissions.												Total.					
	Male.						Female.											
	Eurasians.	Chinese.	Malays.	Javanese.	Sikhs.	Tamils.	Japanese.	Others.	Chinese.	Malays.	Javanese.	Sikhs.	Tamils.	Japanese.	Others.	M.	F.	T.
1. Intellectual { (a) With Epilepsy ... (b) Without Epilepsy ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2. Moral ...	...	3	...	1	...	1	...	...	1	...	...	...	...	...	...	5	1	6
1. Insanity with Epilepsy	...	5	2	...	...	6	...	...	2	...	...	...	...	1	...	13	3	16
2. General Paralysis ...	...	21	...	...	...	...	1	...	4	...	...	...	...	...	...	22	5	27
3. Insanity with grosser brain lesions	...	2	...	...	...	...	...	...	2	...	...	...	...	...	...	2	2	4
4. Acute Delirium ...	...	2	...	...	...	1	...	...	...	...	...	...	...	...	...	3	...	3
5. Confusional Insanity ...	...	30	9	1	...	20	...	...	4	...	2	...	6	1	...	60	13	73
6. Stuper ...	...	1	...	...	2	...	...	1	...	...	...	...	1	...	...	4	1	5
7. Primary Dementia ...	...	27	6	2	...	5	...	...	5	...	1	...	2	...	...	40	12	52
8. Mania ... { (a) Recent (b) Chronic (c) Recurrent	...	50	6	2	...	33	...	1	10	3	1	...	5	...	...	92	20	112
9. Melancholia { (a) Recent (b) Chronic (c) Recurrent	...	5	...	...	1	1	...	...	4	1	...	...	...	2	...	6	7	13
10. Alternating Insanity ...	...	46	3	2	...	27	...	...	5	...	...	...	17	...	...	80	22	102
11. Delusional { (a) Systematised (b) Non-Systematised	...	2	...	...	...	1	...	...	1	...	...	...	...	...	...	3	1	4
12. Volitional { (a) Impulse (b) Obsession (c) Doubt	...	13	1	...	...	6	...	...	...	...	...	...	...	...	...	20	...	20
13. Moral Insanity ...	...	9	2	...	...	3	...	...	...	...	...	...	...	...	...	4	1	5
14. Dementia ... { (a) Senile (b) Secondary	...	6	2	1	...	...	...	1	2	...	...	...	...	...	...	10	2	12
15. Not Insane ...	...	1	...	...	...	2	...	...	...	...	...	...	...	...	...	1	...	1
Total ...	1	226	32	9	3	108	1	3	41	8	4	...	32	4	2	383	91	474



## III.

*Table showing the form of mental disorder on admission in those discharged, recovered during the year 1922.*

Forms of mental disorder (on admission).					M.	F.	Total.	
1.	Intellectual	...	{ (a) With Epilepsy	...				
			{ (b) Without Epilepsy	...				
2.	Normal	...	...	...				
3.	Insanity with Epilepsy	...	...	...	5	0	5	
4.	Acute Delirium	...	...	...	...	1	1	
5.	Confusional Insanity	...	...	...	23	3	26	
6.	Stuper	...	...	...	2	1	3	
7.	Primary Dementia	...	...	...	12	...	12	
8.	Mania	...	{ (a) Recent	...	59	20	79	
			{ (b) Chronic	...	5	...	5	
			{ (c) Recurrent	...	5	2	7	
9.	Melancholia	...	{ (a) Recent	...	31	16	47	
			{ (b) Chronic	...	2	...	2	
			{ (c) Recurrent	...	5	...	5	
10.	Alternating Insanity	...	...	...	3	...	3	
11.	Delusional Insanity	...	{ (a) Systematised	...	...			
			{ (b) Non-Systematised	...	8	...	8	
12.	Volitional Insanity	...	{ (a) Impulse	...	...			
			{ (b) Obsession	...	...			
			{ (c) Doubt	...	...			
13.	Moral Insanity	...	...	...	...			
14.	Dementia	...	{ (a) Senile	...	1	...	1	
			{ (b) Secondary	...	...			
Total					...	161	43	204





## IV.

*Aetiological.*—Showing the aetiological factors and associated conditions in the direct admissions during the year 1922 distinguishing between cases—congenital, first attack, non-first attack and unknown whether first attack or not.

Aetiological factors and associated conditions.	Congenital cases.									First attack cases.									Not first attack cases.									Cases unknown whether first attack or not.									Total direct admissions.										
	Principal.			Contributory.			Total incidence.			Principal.			Contributory.			Total incidence.			Principal.			Contributory.			Total incidence.			Principal.			Contributory.			Total incidence.			Total principal.			Total contributory.			Grand total incidence.				
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.					
A.—Heredity (excluding cousins, nephews, nieces and offspring)—																																															
1. Insane ...	...	...	...	...	...	...	...	...	...	3	4	7	...	...	...	3	4	7	4	...	4	...	...	...	4	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
2. Epileptic ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
3. Neurotic (including only hysteria, neurasthenia, spasmodic (idiopathic), asthma and chorea) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
4. Eccentricity (inmarked degree) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
5. Alcoholism ...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	1	1	2	1	...	1	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
B.—Mental instability as revealed by—																																															
1. Moral deficiency ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
2. Congenital mental defect not amounting to imbecility ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
3. Eccentricity ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
C.—Deprivation of special sense—																																															
1. Smell or taste ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
2. Hearing ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
3. Sight ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
D.—Critical periods—																																															
1. Puberty and adolescence ...	...	...	...	...	...	...	...	...	...	12	4	16	4	...	4	16	4	20	5	1	6	...	...	...	5	1	6	...	6	5	1	6	11	1	12	23	5	28	9	1	10	32	6	38			
2. Climacteric ...	...	...	...	...	...	...	...	...	...	4	1	5	2	...	2	6	1	7	1	...	1	...	...	...	1	...	1	1	2	2	...	2	3	1	4	6	2	8	4	...	4	10	2	12			
3. Senility ...	...	...	...	...	...	...	...	...	...	2	...	2	1	...	1	3	...	3	...	1	1	1	...	1	1	1	2	6	1	7	1	...	1	7	8	2	10	3	...	3	11	2	13				
E.—Child bearing—																																															
1. Pregnancy ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
2. Puerperal state (not septic) ...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	1	1	...	1	1	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
3. Lactation ...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	1	1	...	1	1	...	...	...	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
F.—Mental stress—																																															
1. Sudden ...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	1	2	2	1	3	...	...	...	...	1	1	...	1	1	...	...	...	...	1	...	1	...	1	...	1	2	2	4	3	2	5		
2. Prolonged ...	...	...	...	...	...	...	...	...	...	...	3	1	4	17	2	19	20	3	23	...	1	1	6	...	6	6	1	7	...	...	...	...	6	...	6	6	...	6	3	2	5	29	2	31	32	4	36
G.—Physiological defects and errors—																																															
1. Malnutrition in early life (signs of rickets, etc.) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			
2. Privation and starvation ...	...	...	...	...	...	...	...	...	...	...	1	...	1	7	...	7	8	...	8	...	...	...	4	...	4	4	...	4	...	...	...	...	5	...	5	5	...	5	1	...	1	16	...	16	17	...	17
3. Over-exertion ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
4. Masturbation ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
5. Sexual excess ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
H.—Toxic—																																															
1. Alcohol ...	...	...	...	...	...	...	...	...	...	...	24	1	25	14	2	16	38	3	41	4	2	6	4	1	5	8	3	11	8	...	8	4	...	4	12	...	12	36	3	39	22	3	25	58	6	64	
2. Drug habit (morphia, cocaine, etc.) ...	...	...	...	...	...	...	...	...	...	...	2	...	2	...	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
3. Lead and other such poisons ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
4. Tuberculosis ...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	2	1	1	2	...	...	...	...	...	...	...	...	...	2	...	2	4	1	5	6	1	7	2	...	2	5	2	7	7	2	9		
5. Influenza ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
6. Puerperal sepsis ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
7. Other specific fevers ...	...	...	...	...	...	...	...	...	...	...	2	...	2	...	...	2	...	2	...	1	1	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
8. Syphilis acquired ...	...	...	...	...	...	...	...	...	...	...	15	3	18	1	...	1	16	3	19	1	...	1	1	1	2	2	...	2	10	2	12	3	...	3	13	1	14	26	5	31	5	...	5	31	4	35	
9. Congenital syphilis ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
10. Other toxins, malaria ...	...	...	...	...	...	...	...	...	...	...	11	2	13	28	9	37	39	11	50	...	...	...	1	1	2	1	1	2	9	3	12	13	1	14	22	4	26	20	5	25	42	11	53	62	16	78	
I.—Traumatic—																																															
1. Injuries ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
2. Operations ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
3. Sunstroke ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
J.—Diseases of nervous system—																																															
1. Lesions of brain ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
2. Lesions of spinal cord and nerves ...	...	...	...	...	...	...	...	...	...	...	...																																				





## V.

*An analysis of the discharges and transfers during the year 1922.*

	M.	F.	T.	M.	F.	T.	M.	F.	T.
Discharged as recovered from direct admissions—									
First attack cases ... ..	108	26	134						
Not first attack cases ... ..	29	10	39						
Cases unknown whether first attack or not ... ..	24	7	31						
Total from direct admission ...	161	43	204						
From transfers—									
First attack cases ... ..									
Not first attack cases ... ..									
Cases unknown whether first attack or not ... ..									
Total from transfers ... ..									
Total discharged as recovered ...	...	...	...	...	...	...	161	43	204
				Relieved.			Not improved.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.
Discharged (not recovered) as—									
Relieved ... ..	16	10	26	16	10	26			
Not improved ... ..	7	2	9	...	...	...	7	2	9
Total ...	23	12	35						
Reasons for such discharges—									
To go to care of friends ... ..									
Statutory by irregularity in reception order ... ..									
Other reasons (specifying them) ...									
Total ...									
Transferred as—									
Relieved ... ..									
Not improved ... ..									
Total ...									
Destination of such transfers—									
To leper asylum ... ..	1	0	1						
To single care ... ..									
Other destinations (specifying such) ... ..									
Total ...									
Total discharged and transferred as—									
Relieved ... ..	...	...	...	16	10	26			
Not improved ... ..	...	...	...	...	...	...	7	2	9

Four male patients included in year's admissions discharged "Not insane".

VI.

Table showing the form of mental disorder on 31st December, 1922, of those on the Registers at that date.

Forms of mental disorder on 31st December, 1922.						M.	F.	Total.
1.	Intellectual	...	...	{ (a) With Epilepsy	...	1	...	1
				{ (b) Without Epilepsy	...	21	8	29
2.	Moral	...	...	...	...			
1.	Insanity with Epilepsy	...	...	...	...	19	11	30
2.	General Paralysis of the insane	...	...	...	...	11	1	12
3.	Insanity with grosser brain lesion	...	...	...	...	8	3	11
4.	Acute Delirium	...	...	...	...			
5.	Confusional Insanity	...	...	...	...	51	7	58
6.	Stuper	...	...	...	...	9	2	11
7.	Primary Dementia	...	...	...	...	111	29	140
				{ (a) Recent	...	38	12	50
8.	Mania	...	...	{ (b) Chronic	...	29	5	34
				{ (c) Recurrent	...	7	3	10
				{ (a) Recent	...	37	15	52
9.	Melancholia	...	...	{ (b) Chronic	...	82	9	91
				{ (c) Recurrent	...	4	2	6
10.	Alternating Insanity	...	...	...	...	48	7	55
11.	Delusional Insanity	...	...	{ (a) Systematised	...	21	4	25
				{ (b) Non-Systematised	...	19	2	21
				{ (a) Impulse	...	3	...	3
12.	Volitional Insanity	...	...	{ (b) Obsession	...			
				{ (c) Doubt	...	1	...	1
13.	Moral Insanity	...	...	...	...			
14.	Dementia	...	...	{ (a) Senile	...	17	7	24
				{ (b) Secondary	...	301	84	385
15.	Not Insane	...	...	...	...	...	1	1
Total						838	212	1,050
Prospect of mental recovery								
				{ Favourable	...	...	164	
				{ Doubtful	...	...	166	
				{ Unfavourable	...	...	720	



SPECIFIC DISEASES WHICH CAUSED DEATH DURING 1922.

										Deaths.
General paralysis of the insane ...	...	...	...	...	...	...	...	...	...	21
Phthisis ...	...	...	...	...	...	...	...	...	...	21
Dysentery ...	...	...	...	...	...	...	...	...	...	16
Malaria ...	...	...	...	...	...	...	...	...	...	12
Nephritis ...	...	...	...	...	...	...	...	...	...	8
Exhaustion	...	...	...	...	...	...	...	...	...	8
Ankylostomiasis ...	...	...	...	...	...	...	...	...	...	6
Peritonitis ...	...	...	...	...	...	...	...	...	...	3
Haemorrhage due to rupture of spleen ...	...	...	...	...	...	...	...	...	...	3
Abscess of the brain	...	...	...	...	...	...	...	...	...	2
Arterio-sclerosis ...	...	...	...	...	...	...	...	...	...	2
Gumma of the brain	...	...	...	...	...	...	...	...	...	1
Haemorrhage due to rupture of small intestine	...	...	...	...	...	...	...	...	...	1
Gangrene of the left arm	...	...	...	...	...	...	...	...	...	2
Pneumonia	...	...	...	...	...	...	...	...	...	1
Septicaemia	...	...	...	...	...	...	...	...	...	1
Valvular disease of heart	...	...	...	...	...	...	...	...	...	1
Tubercular disease of hip joint ...	...	...	...	...	...	...	...	...	...	1
Cystic kidney	...	...	...	...	...	...	...	...	...	1
Empyæma of right chest	...	...	...	...	...	...	...	...	...	1
Gangrene of the lung	...	...	...	...	...	...	...	...	...	1
Status Epilepticus	...	...	...	...	...	...	...	...	...	1
Debility	...	...	...	...	...	...	...	...	...	1
Pericarditis	...	...	...	...	...	...	...	...	...	1
Erysipelas ...	...	...	...	...	...	...	...	...	...	1
Cancer of liver	...	...	...	...	...	...	...	...	...	1
Cerebral abscess	...	...	...	...	...	...	...	...	...	1
Hepatic cirrhosis ...	...	...	...	...	...	...	...	...	...	1
Tubercular ulceration of intestines	...	...	...	...	...	...	...	...	...	1
Septic bronchitis ...	...	...	...	...	...	...	...	...	...	1
Tubercular enteritis	...	...	...	...	...	...	...	...	...	1
Cancer of stomach	...	...	...	...	...	...	...	...	...	1
Total										124



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